Upper Rapid Creek Subwatersheds Riparian Project Stream Assessment Report

Developed for the

Portneuf Soil and Water Conservation District

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IDAHO SOIL CONSERVATION COMMISSION

Acknowledgements

The Portneuf Soil and Water Conservation District and the Idaho Soil Conservation Commission would like to thank several people for contributing their time, effort and expertise. Specifically those include: Ron Davidson, Bruce Sandoval, Clay Erickson and Ron Gill with the United States Department of Agriculture-Natural Resources Conservation Service; Sara Jo John and Janet Baker with the Portneuf Soil and Water Conservation District; Christine Fischer, Elliot Traher and Steve Smith with the Idaho Association of Soil Conservation Districts and the landowners and residents in the Upper Rapid Creek Subwatersheds Project Area.

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Acronyms

BMP - Best Management Practice.

BIA - Bureau of Indian Affairs, United States Department of Interior.

BLM - Bureau of Land Management, United States Department of Interior.

CRP - Conservation Reserve Program, Farm Service Agency.

DEM - Digital Elevation Model.

DOQQ - Digital Orthophoto Quarter Quadrangle.

DRG - Digital Raster Graphic.

FSA - Farm Service Agency, United States Department of Agriculture.

HC - Hagler Creek.

IASCD - Idaho Association of Soil Conservation Districts.

IDEQ - Idaho Department of Environmental Quality.

IDFG - Idaho Department of Fish and Game.

IDL - Idaho Department of Lands.

ISCC - Idaho Soil Conservation Commission.

MNC - McNabb Creek.

NFRC - North Fork Rapid Creek.

NRCS - Natural Resources Conservation Service, United States Department of Agriculture.

PSWCD - Portneuf Soil and Water Conservation District.

PS - Practice Standard, Natural Resources Conservation Service.

SAWQP - State Agricultural Water Quality Program, State of Idaho.

SCS - Soil Conservation Service, former name of the Natural Resources Conservation Service.

SECI - Stream Erosion Condition Inventory.

SVAP - Stream Visual Assessment Protocol.

TMDL - Total Maximum Daily Load.

USFS - Forest Service, United States Department of Agriculture.

USGS - Geological Survey, United States Department of Interior.

WFRC - West Fork Rapid Creek.

WQLS - Water Quality Limited Segment.

Introduction

Purpose

The goal of the Upper Rapid Creek Subwatersheds Riparian Project is to restore cold water biota beneficial uses on 4.6 miles of stream. In 1999, the PSWCD initiated a project that would inventory, plan and implement BMPs in the riparian area along Rapid Creek. The PSWCD received an Idaho Nonpoint Source §319 Grant for the Upper Rapid Creek Subwatersheds Riparian Project in 2001. The purpose of this report is to identify stream reaches for restoration and guide BMP implementation efforts within the project area. Following the completion of this report, a separate project implementation plan with recommended BMPs for each assessed reach will be completed.

Beneficial Uses

Rapid Creek (WQLS#2334) is on the State of Idaho 303(d) List (IDEQ 1998) of water quality impaired water bodies. Rapid Creek is listed from its headwaters to the Portneuf River. Rapid Creek's designated beneficial uses include cold water biota, salmonid spawning, secondary contact recreation, agricultural water supply, industrial water supply, wildlife habitat and aesthetics. Cold water biota is not fully supported due to sediment. IDEQ doesn't suggest any specific reductions for Rapid Creek. However, the Portneuf River TMDL recommends a 65% reduction in total suspended sediment for the lower Portneuf River (IDEQ 1999).

Background

The Upper Rapid Creek subwatersheds were inventoried and planned in 1987 by the PSWCD, ISCC, IDEQ and NRCS as part of the Lower Portneuf River Agricultural Water Pollution Abatement Plan (PSWCD 1987). The PSWCD obtained the Upper Rapid Creek Subwatershed SAWQP grant in 1989 for $467,779. The project was implemented and completed in 1999. Thirteen landowners placed BMPs on 4,425 acres of crop, pasture and range lands. The project treated approximately 88% of the critical acres. The Upper Rapid Creek Subwatersheds Riparian Project will build upon past conservation accomplishments that were made through the Upper Rapid Creek Subwatershed SAWQP Project.

Project Setting

The Upper Rapid Creek Subwatershed Riparian Project Area, as shown in Figure 1, is located in north central Bannock County and is 13 miles east of Pocatello and 4 miles north of Inkom. The project area consists of two subwatersheds, West Rapid (USGS Hydrologic Unit Code 170402080304) and North Rapid (USGS Hydrologic Unit Code 170402080305), which drain approximately 16,195 acres or 25 square miles. The subwatersheds are located in the Inkom Watershed (USGS Hydrologic Unit Code 1704020803) which is in the Portneuf River Subbasin (USGS Hydrologic Unit Code 17040208).

Fort Hall Indian Reservation borders the subwatersheds on the north. On the east, the Portneuf Range bounds the project area. On the south, the boundary is the confluence of North Fork Rapid and West Fork Rapid creeks. The western boundary is the Pocatello Range. The West Rapid Subwatershed drains 7,346 acres and the North Rapid Subwatershed drains 8,815 acres. Elevations range from 7,902 feet at an unnamed peak in the Portneuf Range to 5,060 feet at the confluence of the North and West forks.

Approximately 72% of the land within the subwatersheds are privately owned. About 28% is publicly owned and managed by BLM, USFS or IDL. Range land is the predominant land use within the subwatersheds at 78% of the acres. Land ownership and land use percentages are shown in Tables 1 and 2, respectively. The map of land ownership is Figure 2 and the land use map is Figure 3.

Table 1. Upper Rapid Creek Subwatersheds Land Ownership

Land Ownership	Acres	Percent of Total
BIA	307	1.9%
BLM	2,612	16.1%
Private	11,670	72.0%
IDL	300	1.9%
USFS	1,262	7.8%
Water	44	0.3%
Total	16,195	100.0%

Table 2. Upper Rapid Creek Subwatersheds Land Use

Land Use	Acres	Percent of Total
CRP	1,519	9.4%
Forest Land	190	1.1%
Gravel Pits	6	0.1%
Non-Irrigated Crop Land	1,530	9.4%
Range Land	12,678	78.3%
Creeks	44	0.3%
Roads	189	1.1%
Rural Residences	45	0.3%
Total	16,195	100.0%

Climate

The Upper Rapid Creek subwatersheds are in the intermountain region that is characterized by moderately cold winters and hot dry summers. The frost-free period varies from 60 to 120 days. The last frost in spring can occur as late as May 20th and the first frost can be as early as September 20th. Extremes of temperature typically range from the minus 20s in winter to the mid-90s in summer. Precipitation varies from 10 to 25 inches per year. Most of the precipitation occurs in the early spring and late fall and snowpack accumulation is the most important source of water for the region (PSWCD 1987).

Fishery

Rapid Creek supports a good population of native cutthroat trout and the upper reaches of the creek and its perennial tributaries provide spawning and rearing areas (PSWCD 1992). More recently the IDFG electorfished North Fork Rapid Creek at three sites in June 2000. Numerous cutthroat trout ranging from 3 to 10 inches and mottled sculpin were found in the middle and lower survey sites on North Fork Rapid Creek. There were no fish found at the upper survey site on North Fork Rapid Creek (IDFG 2000).

Geology

Topography in the subwatersheds is mountainous with steep mountains and narrow valleys. There are four geologic formations in the subwatersheds listed below in Table 3 and shown in Figure 4.

Table 3. Upper Rapid Creek Subwatersheds Geology (IDWR 1999)

Formation	Description	Acres
Quaternary (Qw)	Quaternary wind blown deposits; most commonly a loess mantle east of Snake Plain	6,570
Precambrian (Zs)	Younger Precambrian detrital units of southeastern Idaho; subdivisions listed below	3,865
Precambrian (Z2s)	Uppermost Precambrian massive quartzite with carbonate beds overlying	1,990
Precambrian (Z1s)	Precambrian volcanic and diamictic units	3,770

Hydrology

North Fork Rapid Creek originates at 6,200 feet elevation and West Fork Rapid Creek originates at 5,760 feet elevation. Both creeks are perennial and flow six miles descending to 5,060 feet elevation where they

join to form Rapid Creek, which flows south and enters the Portneuf River just below Inkom. Elevations range from 7,902 feet at an unnamed peak in the Portneuf Range to 5,060 feet at the confluence of the North and West forks. The longitudinal profiles for both North and West forks are shown in Figure 6. Both of these creeks are ungaged consequently no streamflow data for these creeks have been published.

North Fork Subwatershed is triangular shaped, being six miles wide and four miles long. The subwatershed drains 8,815 acres. North Fork Rapid Creek flows from north to south and is six miles in length from its headwaters to its confluence with West Fork Rapid Creek. Perennial tributaries include Moonlight, McNabb and Hagler creeks. The North Fork Subwatershed has a south aspect. West Fork Subwatershed is oblong shaped, being two miles wide and five miles long. The subwatershed drains 7,346 acres. West Fork Rapid Creek flows from northwest to southeast and is six miles in length from its headwaters to its confluence with North Fork Rapid Creek. There are no perennial tributaries to West Fork Rapid Creek. The West Fork Subwatershed has a southeast aspect.

Soils

The project area is covered by the Bannock County Soil Survey (SCS 1987). Soils range from cobbly and gravelly silt loams to silt loams on 4 to 30 percent slopes, as listed in Table 4. A general soils texture map is shown in Figure 5. The foothills and mountains in the subwatersheds have moderately deep to very deep, well-drained noncalcareous soils. The surface layer is gravelly to very cobbly silt loam. The natural vegetation on these soils provides excellent protection from erosion, but when overgrazed or disturbed, these soils are highly susceptible to water erosion. Soils in the valleys are well drained and generally deep or very deep. Most of these soils formed from loess or silty alluvium derived from loess and are highly susceptible to water erosion when left bare (SCS 1987).

Table 4. Upper Rapid Creek Subwatersheds Soils Characteristics (SCS 1987)

Map Unit Symbol	Map Unit Description	Slopes	Surface Texture	Acres	Percent of Total
3	Arbone-Hondoho	12-20%	Gravelly Silt Loam	55	0.3%
25	Camelback-Hades	6-20%	Extremely Stony Silt Loam	305	1.9%
26	Camelback--Valmar-Hades	20-30%	Gravelly Silt Loam	245	1.5%
44	Enochville-Enochville Variant	0-1%	Silt Loam	195	1.2%
48	Hades-Holmes	1-10%	Gravelly Silt Loam	130	0.8%
50	Hades-Lanoak-Camelback	20-50%	Gravelly Silt Loam	80	0.5%
56	Hondoho-Lanoak-Camelback	20-50%	Cobbly Silt Loam	25	0.2%
66	Lanoak	4-12%	Silt Loam	505	3.1%
67	Lanoak	12-20%	Silt Loam	715	4.4%
68	Lanoak	20-30%	Silt Loam	95	0.6%
70	Lanoak-Greys association	4-12%	Silt Loam	290	1.8%
71	Lanoak-Greys association	12-20%	Silt Loam	2,365	14.6%
72	Lanoak-Hades complex	6-20%	Silt Loam	455	2.8%
78	Moonlight	30-60%	Silt Loam	445	2.7%
79	Moonlight-Camelback association	30-60%	Silt Loam	1,485	9.2%
80	Moonlight-Pavohroo complex	30-60%	Silt Loam	1,340	8.3%
83	Pavohroo-Moonlight complex	30-60%	Silt Loam	2,195	13.6%
95	Rexburg	12-20%	Silt Loam	30	0.2%
98	Ririe	4-12%	Silt Loam	14	0.1%
116	Valmar-Camelback-Hades complex	30-60%	Very Cobbly Silt Loam	3,895	24.1%
	Unknown		Unknown	1,330	8.2%
			Total Acres	**16,195**	**100.0%**

Wildlife

Mule deer are the most abundant of the big game animals, but there are also elk and moose present. Beaver, mink, muskrat and other furbearers are found along the streams. Waterfowl use the meadows and streams during migration and nesting seasons. Upland wildlife such as the pheasant and dove can be found near the crop land while Sage, Sharptail, Ruffed, and Forest grouse, Hungarian partridge and rabbits occur near the range and forest lands. In Bannock County, the Gray wolf is listed as endangered and the Bald eagle, Bliss Rapids snails and Ute Ladies'-tresses are listed as threatened. Canada lynx are proposed to be listed while there are no candidate species in Bannock County.

Figure 1. Upper Rapid Creek Subwatersheds Area Map

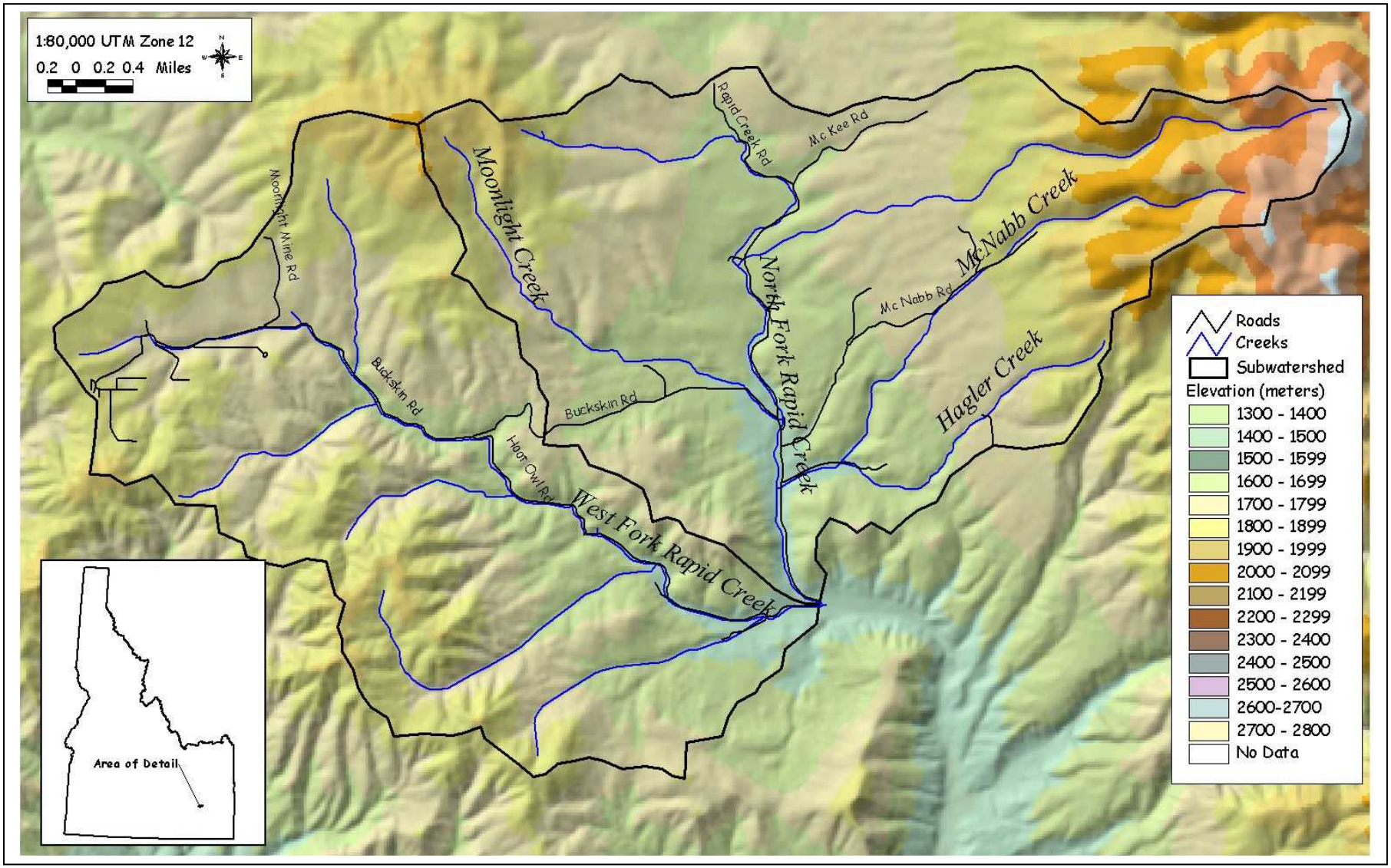


Figure 2. Upper Rapid Creek Subwatersheds Land Ownership Map

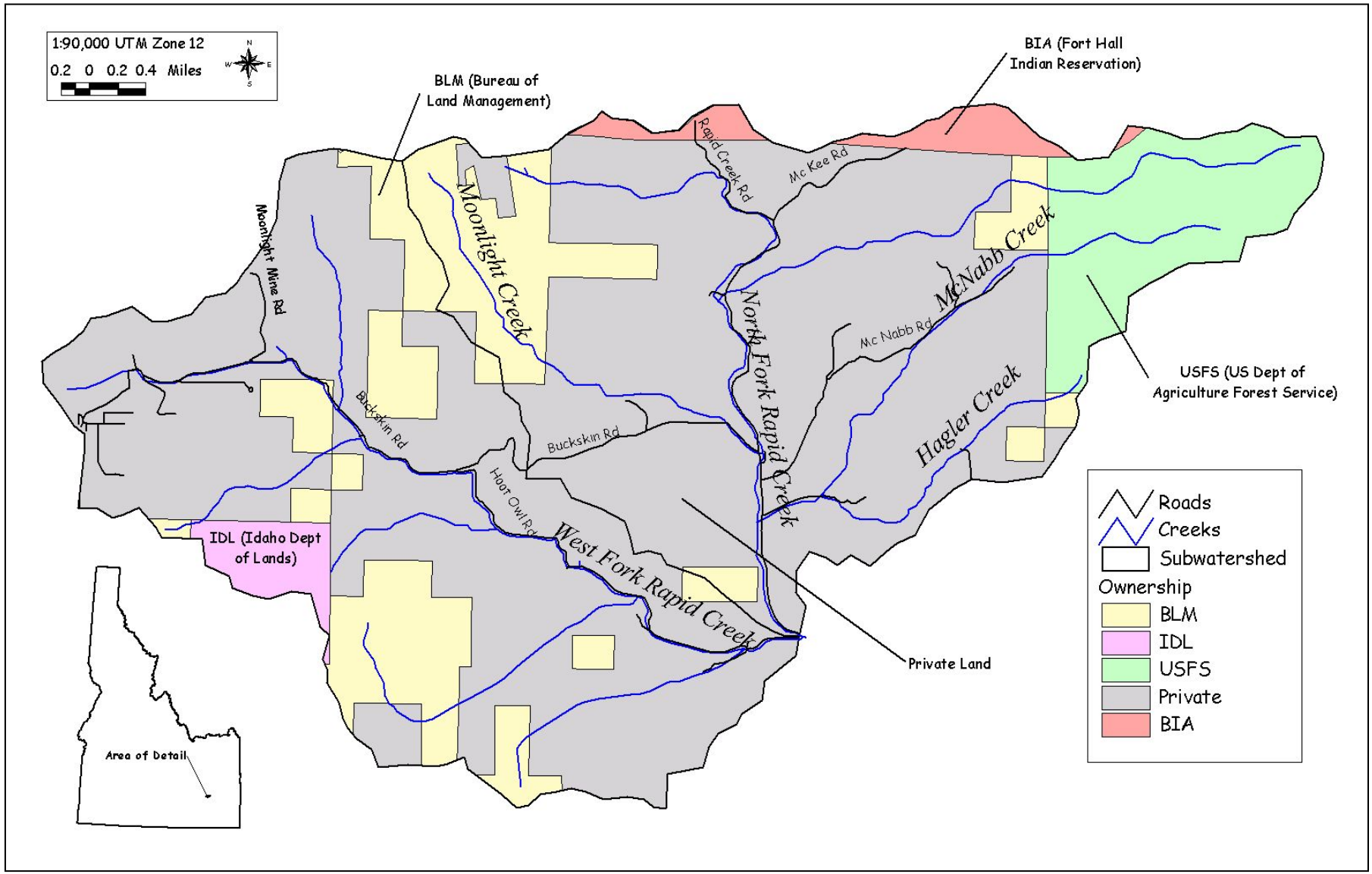


Figure 3. Upper Rapid Creek Subwatersheds Land Use Map

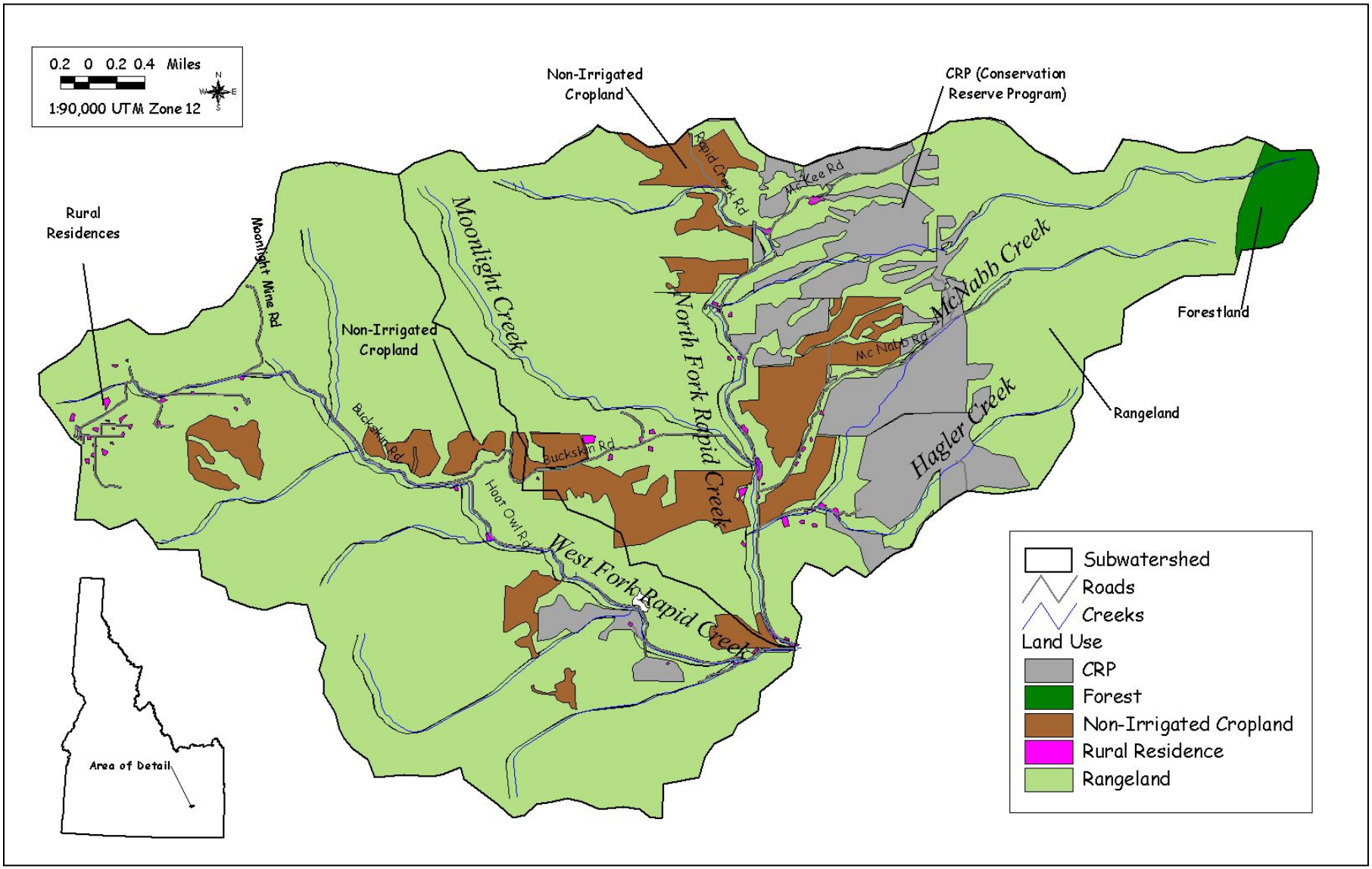


Figure 4. Upper Rapid Creek Subwatersheds Geologic Map

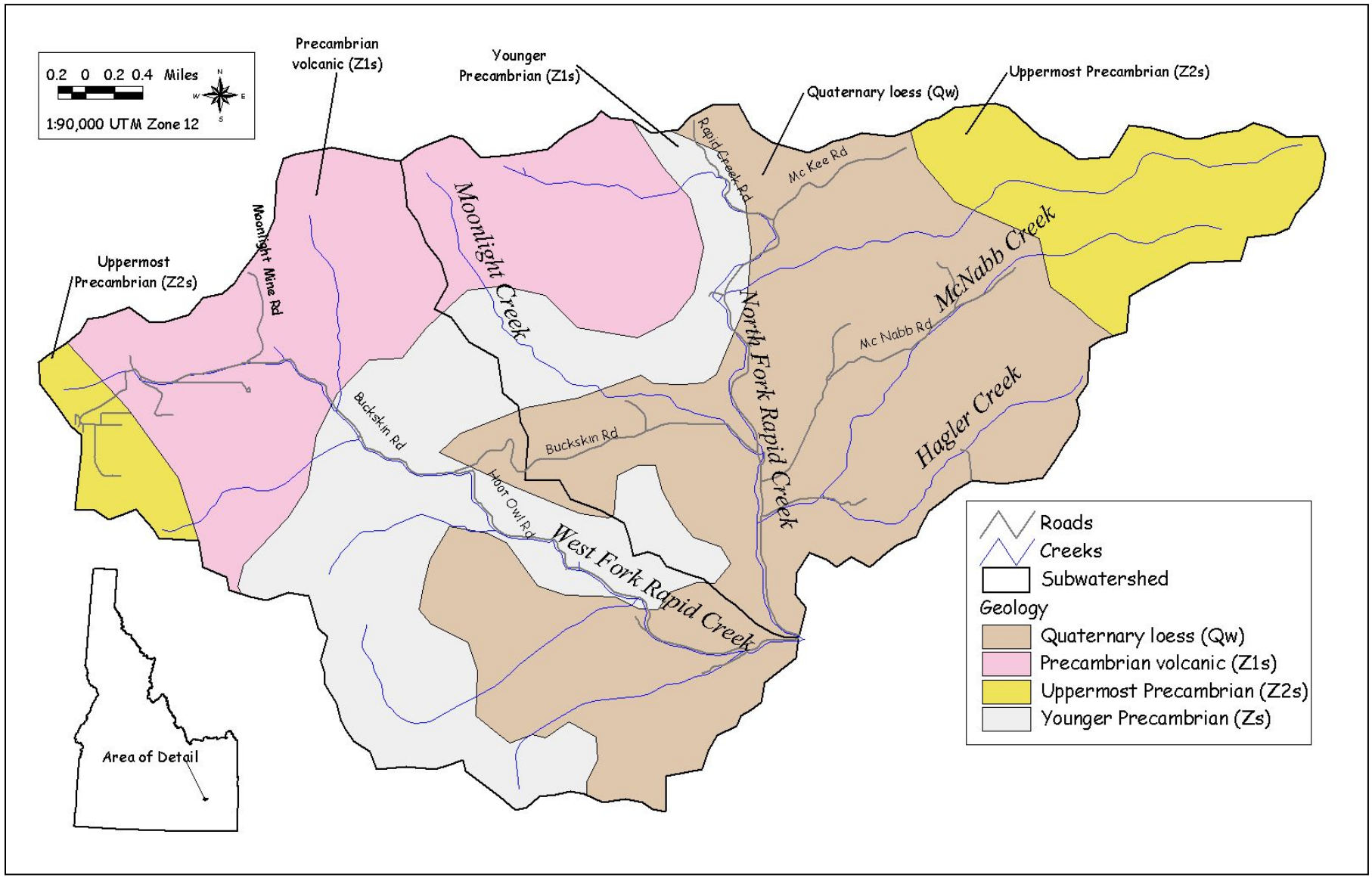


Figure 5. Upper Rapid Creek Subwatersheds Soil Texture Map

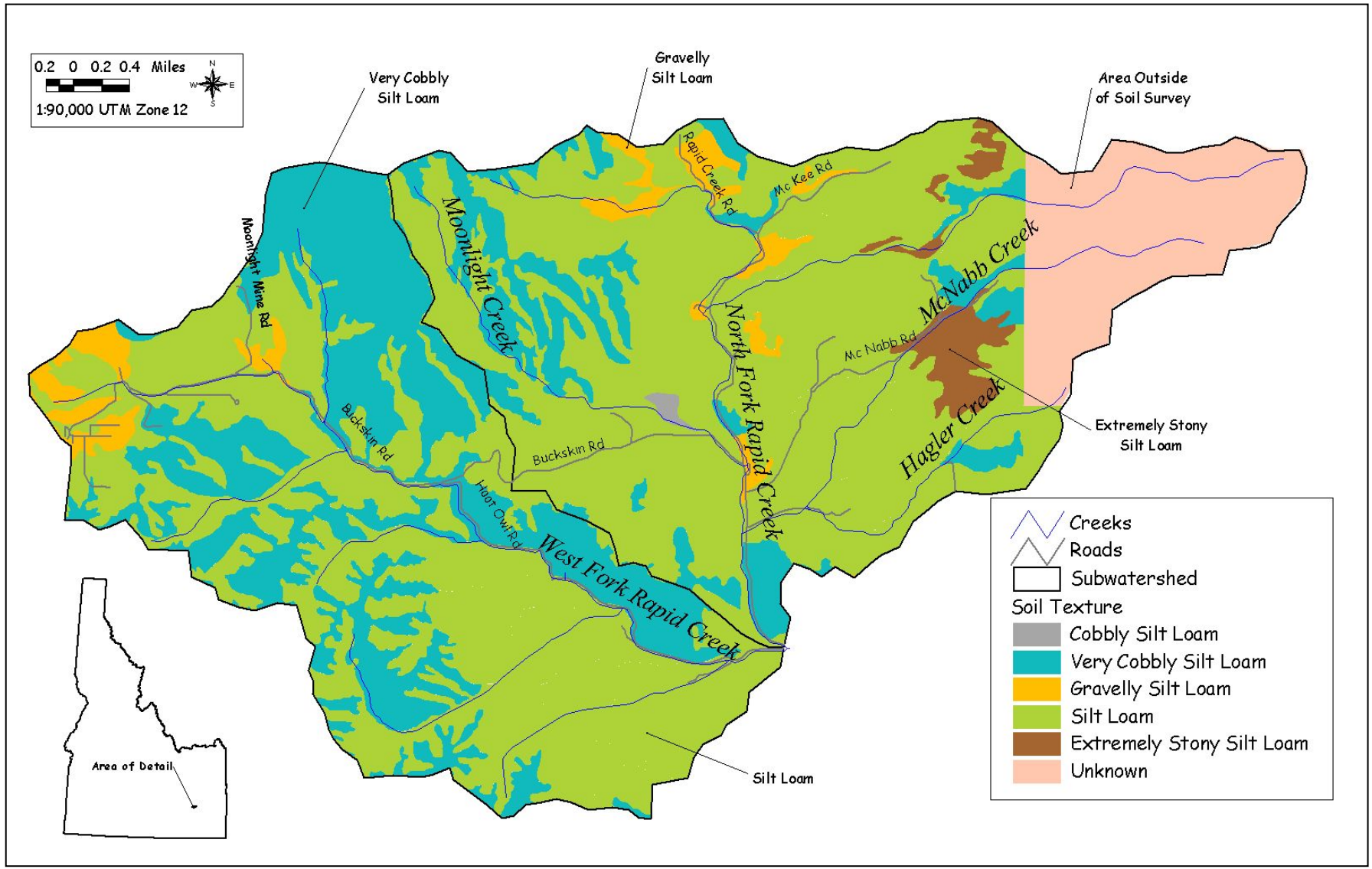
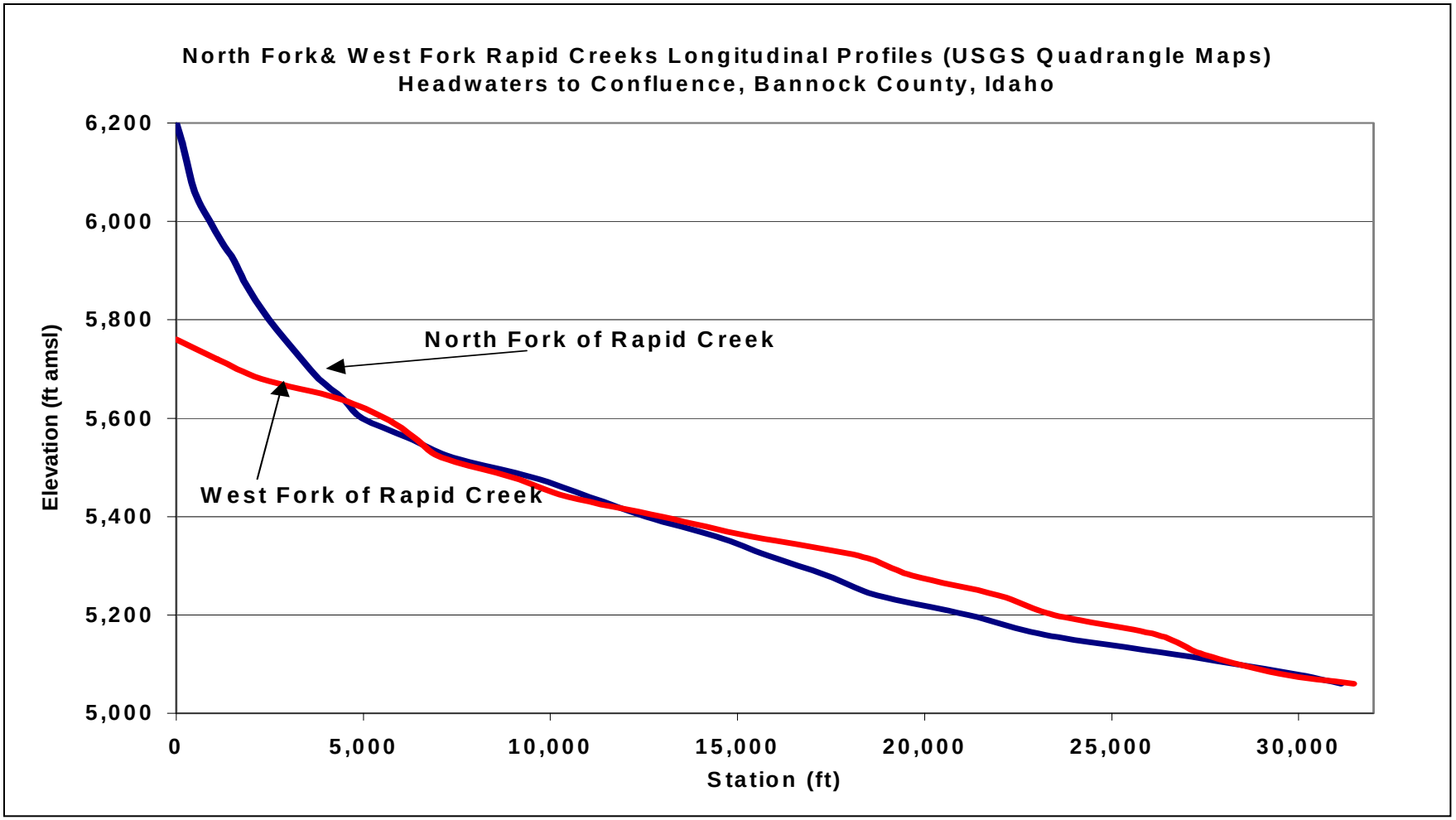


Figure 6. North Fork and West Fork Rapid Creeks Longitudinal Profiles



Assessment Methods

Reach Delineation

The streams were divided into reaches using soils, geology, slope, sinuosity, vegetation, hydrology, roads, drainage area, valley type and land use. Elevations, slopes, stream order and sinuosity were determined from 1:24,000 scale DRGs, DLGs and DEMs. The streams in the subwatersheds were compiled from 1:12,000 scale DOQQs. Reach descriptions are listed in Table 7.

Assessing Aquatic Habitat Suitability

SVAP provides a simple procedure to evaluate the condition of a stream based on visual characteristics. The protocol provides an overall assessment of the condition of the stream and riparian ecosystems, identifies opportunities to enhance biological value and conveys information on how streams function and the importance of protecting or restoring stream and riparian areas (NRCS 1998). SVAP is a qualitative method that includes 14 ranking factors and corresponding numeric values, which are then averaged to rate the reach's condition. Eleven ranking factors are required while three factors are ranked only when applicable. Currently, NRCS requires the use of SVAP when assessing aquatic habitat and recommends that a "fair" condition be achieved as a minimum for conservation plan implementation (NRCS 2001).

Table 5. SVAP Conditions and Average Score Ranges (NRCS 1998)

SVAP Condition	Average Score
Poor	0 to 6.0
Fair	6.1 to 7.4
Good	7.5 to 8.9
Excellent	9.0 to 10.4

Classifying Streams

Rosgen Stream Classification offers a consistent method in which to describe and measure stream characteristics (Rosgen 1996). The classification consists of four levels although this assessment used the first two levels. Level I is a geomorphic characterization that categorizes streams based upon their channel pattern, channel slope and channel shape. These streams are delineated into one of the following types; "A", "B", "C", "D", "DA", "E", "F", or "G". Level II is called the morphological description and requires field measurements such as a cross section and longitudinal profile. The delineative criteria for Level II includes entrenchment ratio, width/depth ratio, dominant channel materials, channel slope and sinuosity. These factors are then used to distinguish individual sub-categories for each stream type.

Estimating Stream Erosion

SECI estimates long-term stream erosion rates. This method produces an index by ranking six factors; bank stability, bank condition, bank cover, channel shape, channel bottom and deposition. The teams used SECI to estimate erosion on the entire reach. Eroding sections, not similar to the entire reach's erosion condition, were measured and ranked separately from the rest of the reach. Stream erosion rates are estimated by applying LRRs to bank height and bank length measurements as shown in Table 8. SECI was used for comparison rather than absolute erosion rates in a sediment budget (NRCS 2000).

Table 6. SECI Conditions, Index and LRR Ranges (NRCS 2000)

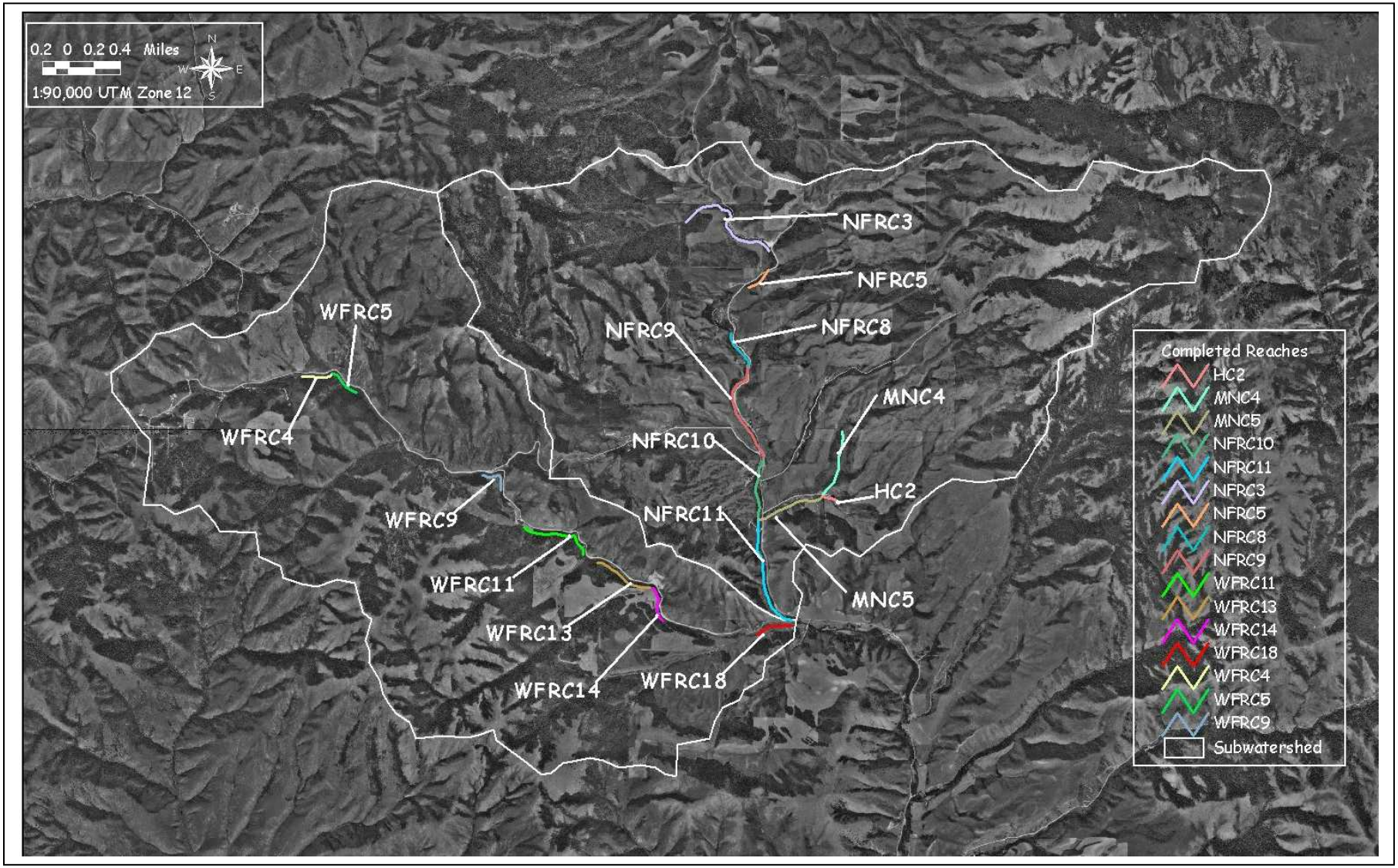
SECI Condition	Index Range	LRR Range
Slight	0 to 4	0.01 to 0.05 ft/yr
Moderate	5 to 8	0.06 to 0.15 ft/yr
Severe	9 to 12	0.16 to 0.30 ft/yr
Very Severe	12 to 15	0.30 to 0.50 ft/yr

Table 7. North and West Forks Rapid, Hagler and McNabb Creeks Reach Descriptions

Reach	Top of Reach Elevation (ft)	Reach Length (ft)	Reach Length (miles)	Reach Slope (%)	Reach Sinuosity	Reach Drainage Area (acres)	Reach Drainage Area (miles^2)
NFRC1	6,200	2,223	0.4	16.2%	1.0	164	0.3
NFRC2	5,840	4,572	0.9	6.1%	1.8	164	0.3
NFRC3	5,560	5,020	1.0	2.4%	1.8	600	0.9
NFRC4	5,440	931	0.2	4.3%	1.8	1,067	1.7
NFRC5	5,400	1,165	0.2	3.4%	1.8	1,102	1.7
NFRC6	5,360	2,085	0.4	1.9%	1.8	1,734	2.7
NFRC7	5,320	624	0.1	3.2%	1.1	1,866	2.9
NFRC8	5,300	1,665	0.3	3.6%	1.1	3,074	4.8
NFRC9	5,240	4,402	0.8	1.5%	1.1	4,002	6.3
NFRC10	5,174	2,614	0.5	1.3%	1.0	4,972	7.8
NFRC11	5,140	4,752	0.9	1.3%	1.1	7,031	11.0
NFRC12	5,080	338	0.1	7.4%	1.1	8,815	13.8
WFRC1	5,980	2,616	0.5	6.9%	1.1	125	0.2
WFRC2	5,800	1,104	0.2	4.5%	1.1	222	0.3
WFRC3	5,750	3,698	0.7	2.7%	1.1	342	0.5
WFRC4	5,650	1,308	0.2	3.8%	1.1	929	1.5
WFRC5	5,600	1,304	0.2	3.1%	1.1	1,395	2.2
WFRC6	5,560	1,494	0.3	4.0%	1.1	1,395	2.2
WFRC7	5,500	1,371	0.3	2.2%	1.0	2,188	3.4
WFRC8	5,470	3,847	0.7	1.8%	1.2	3,035	4.7
WFRC9	5,400	1,396	0.3	2.9%	1.2	3,481	5.4
WFRC10	5,360	1,818	0.3	1.1%	1.2	3,852	6.0
WFRC11	5,340	3,072	0.6	2.0%	1.1	4,333	6.8
WFRC12	5,280	747	0.1	1.3%	1.1	4,838	7.6
WFRC13	5,270	2,504	0.5	2.8%	1.1	5,115	8.0
WFRC14	5,200	1,571	0.3	1.3%	1.2	5,965	9.3
WFRC15	5,180	1,451	0.3	2.8%	1.2	6,292	9.8
WFRC16	5,140	2,004	0.4	2.0%	1.2	6,300	9.8
WFRC17	5,100	509	0.1	3.9%	1.1	7,158	11.2
WFRC18	5,080	1,540	0.3	1.0%	1.1	7,334	11.5
WFRC19	5,065	310	0.1	3.2%	1.1	8,815	13.8
HC1	5,840	2,483	0.5	8.1%	1.1	310	0.5
HC2	5,640	7,172	1.4	6.1%	1.1	733	1.1
MNC3	6,120	1,916	0.4	8.4%	1.1	555	0.9
MNC4	5,960	7,635	1.4	10.0%	1.1	1,497	2.3
MNC5a	5,200	1,455	0.3	2.7%	1.2	2,230	3.5
MNC5b	5,160	1,269	0.2	1.6%	1.2	2,350	3.7

NFRC## - North Fork Rapid Creek Reach Number
WFRC## - West Fork Rapid Creek Reach Number
MNC## - McNabb Creek Reach Number
HC## - Hagler Creek Reach Number

Figure 7. Map of Assessed Reaches of North and West Forks Rapid, Hagler and McNabb Creeks



Assessment Results

Assessment Summary

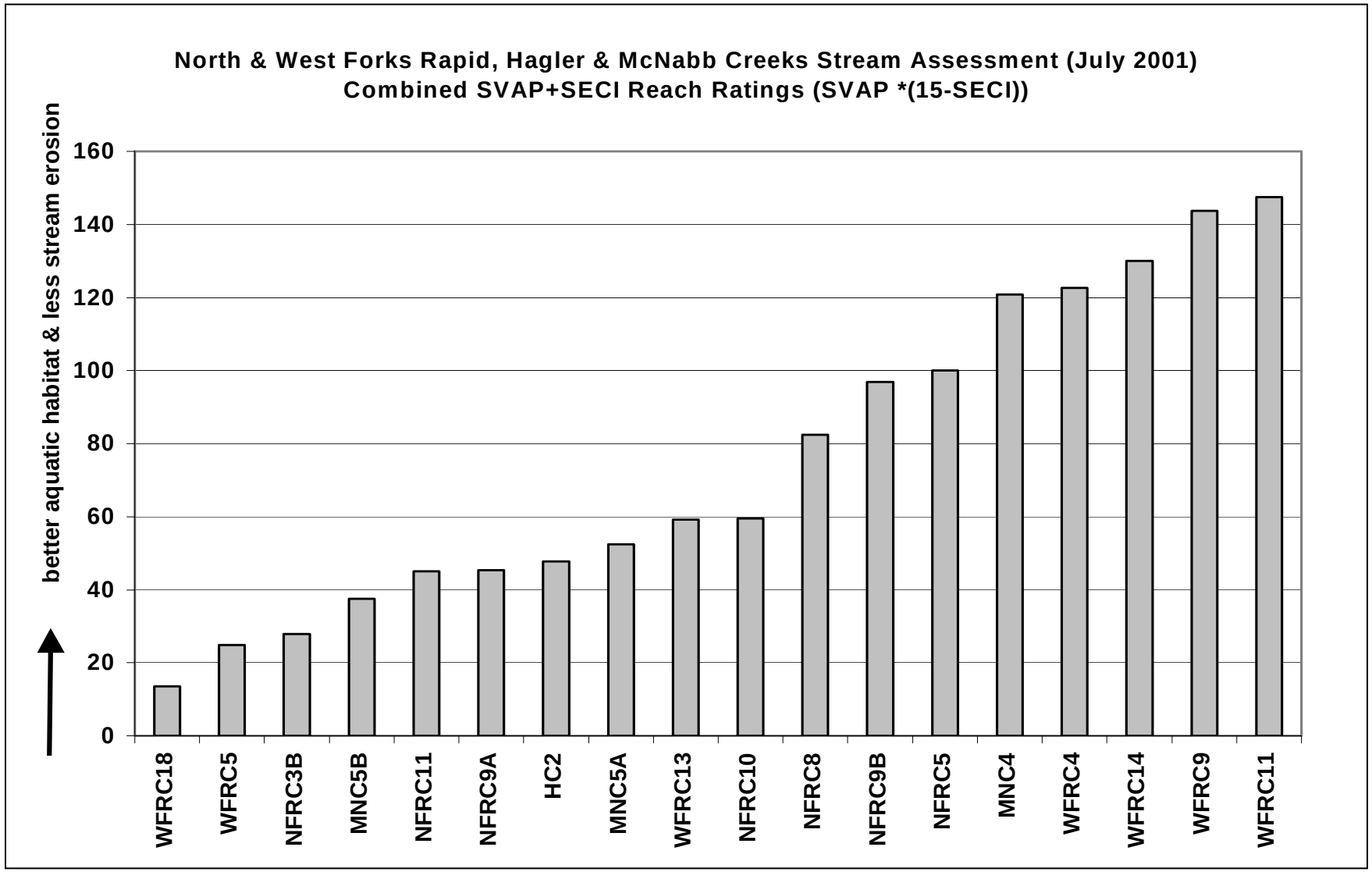
PSWCD, NRCS, ISCC and IASCD staff performed the assessment from July 24th to July 27th, 2001. Thirty-seven reaches were delineated on sixteen miles of streams within the subwatersheds. The teams assessed 18 reaches or 6.5 miles of creeks. These were the only reaches where permission was granted by the landowners to conduct the assessment. The teams did not assess other reaches because permission was not granted. The teams completed field sheets while at each reach. Photos were taken at each reach to document conditions during the assessment. Results for each reach are shown in Table 8. About 3.2 miles of North Fork Rapid Creek, 2.4 miles of West Fork Rapid Creek, 0.8 miles of McNabb Creek and 0.1 miles of Hagler Creek were assessed. The combined SVAP and SECI scores of the assessed reaches are shown in Figure 8. This allows the reaches to be evaluated based upon both habitat suitability and erosion condition.

Table 8. North and West Forks Rapid, Hagler and McNabb Creeks Assessment Summary

Reach	Length (feet)	Length (miles)	Rosgen Stream Type	SVAP Category	SECI Category	Erosion Rate* (tons/year)	Erosion Rate* (tons/mile/year)
NFRC3B	2,130	0.40	E6	Poor	Severe	163	404
NFRC5	1,166	0.22	E6b	Good	Slight	6	26
NFRC8	1,665	0.32	B4c	Fair	Slight	23	73
NFRC9A	1,726	0.33	B5c	Poor	Moderate	111	370
NFRC9B	2,677	0.51	G6c	Fair	Slight	3	5
NFRC10	2,614	0.50	B6c	Fair	Moderate	128	258
NFRC11	4,753	0.90	C5	Fair	Moderate	435	483
WFRC4	1,309	0.25	E5b	Good	Slight	0	1
WFRC5	1,304	0.25	N/A	Poor	Moderate	80	326
WFRC9	1,396	0.26	E5b	Excellent	Slight	0	0
WFRC11	3,073	0.58	E6	Excellent	Slight	0	0
WFRC13	2,506	0.47	C4	Fair	Moderate	73	155
WFRC14	1,572	0.30	G5c	Good	Slight	0	0
WFRC18	1,541	0.29	B5c	Poor	Severe	199	680
MNC4	2,877	0.54	E4b	Good	Slight	1	1
MNC5A	780	0.15	E6b	Fair	Moderate	77	522
MNC5B	637	0.12	N/A	Poor	Moderate	93	773
HC2	758	0.14	N/A	Poor	Moderate	37	258
TOTAL	**34,484 ft**	**6.5 miles**				**1,429 tons/yr**	**220 tons/mile/yr**

* Erosion Rate = (Stream Length *2) * Bank Height * Bulk Density * Lateral Recession Rate

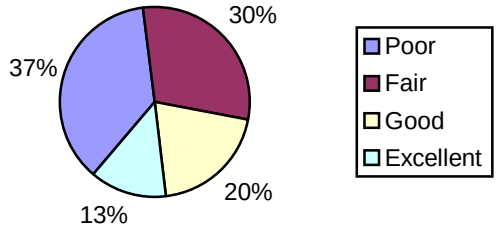
Figure 8. North and West Forks Rapid, Hagler and McNabb Creeks SVAP/SECI Combined Chart



SVAP Results

SVAP results show that 37% or 2.4 miles of the assessed reaches were in poor condition, 30% or 2.0 miles of the assessed reaches rated in fair condition, while 20% or 1.3 miles of the assessed reaches rated in good condition and 13% or 0.8 miles rated in excellent condition. These results are Figure 9. SVAP average scores of each assessed reach are shown in Table B-1 and Figure B-1.

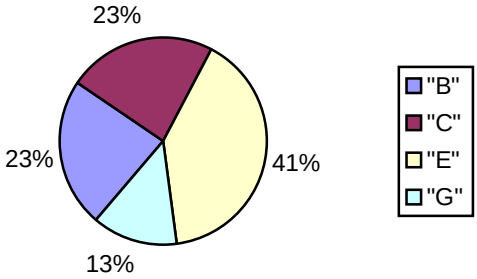
Figure 9. Percent of Assessed Stream Miles for SVAP Rating Categories



Rosgen Stream Type Results

The stream classification of the assessed stream miles estimated that about 23% or 1.4 miles were "B" stream type, 23% or about 1.4 miles were "C" stream type, 41% or 2.4 miles of the assessed reaches were "E" stream type and 13% or 0.8 were "G" type. Specific definitions for the stream types can be found in the glossary. Approximately 0.5 miles of the assessed reaches were not classified due to inaccessibility. These results are shown in Figure 10. Stream types for assessed reaches are shown in Table B-2.

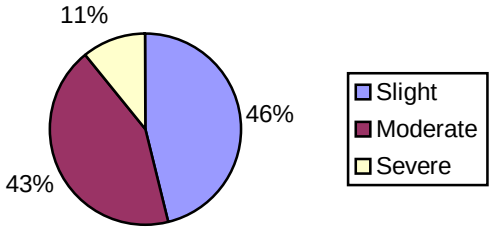
Figure 10. Percent of Assessed Stream Miles for Rosgen Stream Types



SECI Results

SECI results reveal that of the 6.5 miles of assessed stream miles about 46% or 3.0 miles had slight erosion. While 43% or 2.8 miles rated in moderate erosion condition and 11% or 0.7 miles rated in the severe erosion category. These results are shown in Figure 11. SECI average scores of each assessed reach are shown in Table B-3 and Figure B-2. Stream erosion rates for each reach are shown in Figure B-3.

Figure 11. Percent of Assessed Stream Miles for SECI Categories



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Glossary

acre - A unit of area, equivalent to 43,560 square feet.

"A" stream type - A Rosgen stream type characterized by a fairly straight (sinuosity < 1.2), very steep (slope 4-10%), very entrenched (<1.4), single channel, with a low (<12) width/depth ratio.

agricultural water supply - A beneficial use, designated by the Idaho Department of Environmental Quality, which indicates that water quality is at such a level that it can be used for irrigation or livestock watering.

aspect - The direction a surface is facing, generally related to a magnetic bearing. A south aspect would face south.

"B" stream type - A Rosgen stream type characterized by a moderately straight (sinuosity >1.2), moderately steep (slope 2-10%), moderately entrenched (1.4-2.2), single channel, with a moderate (14-26) width/depth ratio.

bankfull discharge - The stream discharge (flow rate, such as cubic feet per second) that forms and controls the shape and size of the active channel and creates the flood plain. This discharge generally occurs once every 1.5 years on average.

beneficial use - A term used by the Idaho Department of Environmental Quality to identify uses which water quality supports in a given stream or lake.

BMP - Best Management Practice; a component practice or combination of component practices determined to be the most effective, practical means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

"C" stream type - A Rosgen stream type characterized by a meandering (sinuosity >1.2), flat (slope 0-2%), slightly entrenched (>2.2), single channel, with a moderate to high (>12) width/depth ratio.

cold water biota - A beneficial use, designated by the Idaho Department of Environmental Quality, which indicates that water quality is high enough to support macroinvertebrates and fish.

"E" stream type - A Rosgen stream type characterized by a extraordinarily meandering (sinuosity >1.4), flat (slope 0-2%), slightly entrenched (>2.2), single channel, with a moderate to high (>12) width/depth ratio.

fish barrier - A structure that prevents fish passage either upstream or downstream.

"G" stream type - A Rosgen stream type characterized by a fairly straight (sinuosity < 1.2), moderately steep (slope 2-4%), very entrenched (<1.4), single channel, with a low (<12) width/depth ratio.

hydrologic unit code - cataloging unit code used by the USGS to organize basins, subbasins, watersheds, subwatersheds and drainages.

hydrology - The scientific study of the properties, distribution and effects of water on and below the earth surface. The effect of flowing water on the land or stream channel.

lateral recession rate - The rate at which a stream bank erodes away from its original position in relation to the stream.

Precambrian - All geologic time and its corresponding rock, before the beginning of the Paleozoic; it is equivalent to about 90% of the geologic time.

Quaternary - The second period of the Cenozoic era, following the Tertiary. This period began two to three million years ago and extends to the present. It consists of two grossly unequal epochs: the Pleistocene, up to about 8,000 years ago and the Holocene since that time.

riparian - A vegetative community associated with surface or subsurface waters and watercourses within active watersheds. This community is rich in diversity of plants, as well as wildlife and aquatic organisms. The habitat includes not only lake and river ecosystems, but also wetland communities.

rural residence - Farmsteads or acreages under 20 acres in size.

salmonid spawning - A beneficial use, designated by the Idaho Department of Environmental Quality, which indicates that water quality is good enough for salmonid fish to use for spawning with a high chance of egg survival.

secondary contact recreation - A beneficial use, designated by the Idaho Department of Environmental Quality, which indicates that water quality supports any activity in which partial or incidental, protected bodily contact occurs with water (e.g. fishing).

sinuosity - The ratio of stream channel length to valley length.

slope - The ratio of vertical measure to horizontal measure.

subbasin - A collection of watersheds that forms a much larger area; such as the Lemhi River subbasin, which yet drains into another, larger system, such as the Salmon River Basin.

substrate - The stream bottom, composed of silt, sand, gravel, cobble, boulder or bedrock. The type of substrate and its looseness affects the ability of fish to spawn and the survivability of the eggs.

subwatershed - A collection of drainages that form a watershed; such as the North Rapid Subwatershed, which drains into a larger area, such as the Inkom Watershed.

suspended sediment - Fine sediment suspended within the water column of moving or standing water.

TMDL - Total Maximum Daily Load, a tool used in the development and implementation of a watershed management plan, determines the total amount of pollutants that can enter a water body before it can no longer fully support its beneficial uses. TMDLs are the sums of individual waste load allocations (WLAs) of point sources, load allocations (LAs) of nonpoint sources and a margin of safety.

tributary - A river or stream that flows into a larger river or stream.

water body – A homogeneous classification that can be assigned to rivers, lakes, estuaries, coastlines, streams or other water features.

water quality – A term used to describe the biological, chemical and physical characteristics of water with respect to its suitability for a beneficial use.

watershed - A collection of subwatersheds that form a subbasin; such as the Inkom Watershed , which drains into a larger area, such as the Portneuf Subbasin.

APPENDIX A

Individual Reach Results

North Fork Rapid Creek

North Fork Rapid Creek Reach 3b (NFRC3b)

The reach starts 1/2 mile south of the Fort Hall Indian Reservation boundary in the NW1/4 of the SE1/4 of Section 16, Township 6 South, Range 36 East. The reach extends downstream for 2,130 feet to the start of NFRC4 at the property line near the school bus turn around. Current land use is pasture and crop land.

Reach	NFRC3b
Length (ft)	2,130
Top of Reach Elevation (ft)	6,200
Stream Order	2nd
Slope (%)	1.4
Sinuosity	1.5
Drainage Area (miles^2)	0.3
SVAP	Poor
SECI	Severe
Erosion (t/yr)	163

This photo of NFRC3b was taken looking downstream. The channel is incised with impacts livestock and the road.

The channel was incised. Riparian zone vegetation extended at least one-third of the active channel width. Stream banks were moderately unstable. Grasses dominated the vegetative community with some willow species present. About 20% to 50% of the creek was shaded. Evidence of livestock access to the riparian area was noted. The reach was vertically unstable caused by numerous small headcuts and one wooden drop structure that was also a fish migration barrier and a small breached earthen dam or road crossing at the bottom of the reach. The reach was found to have erosion and cracking present on stream banks. Stream banks were 40% to 70% bare and covered with annual vegetation. Average bank height was about 3 feet high. Channel substrates were silts and gravels with numerous headcuts and evidence of recent deposition.

Identified Problems

1. Sediment from livestock access, roadside runoff, sheet & rill erosion, stream bank & bed erosion.
2. Temperature from lack of canopy cover.
3. Nutrients from crop land runoff and grazing animals.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Riparian Forest Buffer (NRCS PS-391A), Fencing (NRCS PS-382), Use Exclusion (NRCS PS-472), Stream Channel Stabilization (NRCS PS-584), Tree/Shrub Establishment (NRCS PS-612), Spring Development (NRCS PS-574), Water Well (NRCS PS-642), Watering Facility (NRCS PS-614), Pipeline (NRCS PS-516), Use Exclusion (NRCS PS-472), Fish Passage (NRCS PS-396)
2) Residue Management (NRCS PS-329)
   - With Contour Farming (NRCS PS-330), Pasture & Hay Land Planting (NRCS PS-512)

North Fork Rapid Creek Reach 5 (NFRC5)

The reach starts in the NE1/4 of the NE1/4 of Section 21, Township 6 South, Range 36 East and extends downstream for 1,166 feet to the start of NFRC6. Current land use is range land.

Reach	NFRC5
Length (ft)	1,166
Top of Reach Elevation (ft)	5,400
Stream Order	2nd
Slope (%)	2.5
Sinuosity	1.2
Drainage Area (miles^2)	1.7
SVAP	Good
SECI	Slight
Erosion (t/yr)	6

This photo of NFRC5 was taken looking downstream.

NFRC5 has limited channel incision with the road affecting the creek's access to the floodplain at high flows. The riparian vegetation extended at least two active channel width. Stream banks were stable. No fish migration barriers were present within reach but occur in the reaches upstream from this one. About 50% of the creek was shaded. Occasional manure in the creek was noted. The reach was found to have erosion and cracking present on stream banks. Very little unprotected bank was present. Banks were covered with perennial vegetation. Average bank height was about 3 feet. Channel bottom in sand and small gravels with mobile material from recent deposition. NFRC5 flows into a road culvert and crosses under the county road. The creek is channelized and is located in the road ditch for about 600 feet until NFRC6 begins at an access road and culvert.

This photo of NFRC5 was taken looking downstream from the road.

Identified Problems

1. Sediment from livestock access and crossings.
2. Nutrients from grazing animals.

Recommended BMPs

1) Prescribed Grazing (NRCS PS-528A)
   - With Spring Development (NRCS PS-574), Water Well (NRCS PS-642), Fencing (NRCS PS-382), Watering Facility (NRCS PS-614), Pipeline (NRCS PS-516), Use Exclusion (NRCS PS-472), Channel Vegetation (NRCS PS-322), Tree/Shrub Establishment (NRCS PS-612)

North Fork Rapid Creek Reach 8 (NFRC8)

The reach starts in the SE 1/4 of the SE1/4 of Section 21, Township 6 South, Range 36 East and extends downstream for 1,665 feet where NFRC9a begins. Current land use is range land.

Reach	NFRC8
Length (ft)	1,665
Top of Reach Elevation (ft)	5,300
Stream Order	2nd
Slope (%)	0.9
Sinuosity	1.1
Drainage Area (miles^2)	4.8
SVAP	Fair
SECI	Slight
Erosion (t/yr)	23

This photo of NFRC8 was taken looking downstream.

The channel was not incised. Riparian zone vegetation extended at least one active channel width. Stream banks were moderately stable. About 20% to 50% of the creek was shaded. No evidence of livestock access to the riparian area was noted. There were no fish migration barriers in this reach. The reach was found to have erosion evident. Stream banks covered with perennial vegetation. Channel banks about 3 feet high. Channel bottom in gravels and cobbles with very little evidence of recent deposition.

Identified Problems

1. Sediment from stream bank erosion and road embankments.
2. Temperature from lack of canopy cover.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Riparian Forest Buffer (NRCS PS-391A), Fencing (NRCS PS-382), Tree/Shrub Establishment (NRCS PS-612), Use Exclusion (NRCS PS-472), Channel Vegetation (NRCS PS-322), Prescribed Grazing (NRCS PS-528A), Spring Development (NRCS PS-574), Water Well (NRCS PS-642), Watering Facility (NRCS PS-614), Pipeline (NRCS PS-516)

North Fork Rapid Creek Reach 9a (NFRC9a)

The reach starts in the SE1/4 of the SE1/4 of Section 21, Township 6 South, Range 36 East extends downstream for 1,726 feet to the upper end of NFRC9b. Current land use is range land.

Reach	NFRC9a
Length (ft)	1,726
Top of Reach Elevation (ft)	5,240
Stream Order	2nd
Slope (%)	0.4
Sinuosity	1.1
Drainage Area (miles^2)	6.3
SVAP	Poor
SECI	Moderate
Erosion (t/yr)	111

This NFRC9a photo was taken facing upstream.

The channel was incised. Riparian vegetation extended at least one-half of the active channel width. Stream banks were unstable. About Less than 20% of the creek was shaded. No evidence of livestock access to the riparian area was noted. There were no fish migration barriers in this reach.

The reach was found to have slumps and clumps sloughing off. Stream banks were bare with no vegetative cover. Average bank height was about 5 feet. Channel bottom in silts with evidence of downcutting and recent deposition. This reach had riprap along eroding areas near the county road.

Identified Problems

1. Sediment from stream bank and bed erosion.
2. Temperature from lack of canopy cover.
3. Nutrients from grazing animals.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Riparian Forest Buffer (NRCS PS-391A), Fencing (NRCS PS-382), Use Exclusion (NRCS PS-472), Tree/Shrub Establishment (NRCS PS-612), Channel Vegetation (NRCS PS-322), Spring Development (NRCS PS-574), Water Well (NRCS PS-642), Watering Facility (NRCS PS-614), Pipeline (NRCS PS-516)

North Fork Rapid Creek Reach 9b (NFRC9b)

The reach starts in the NE1/4 of the NE1/4 of Section 28, Township 6 South, Range 36 East extends downstream for 2,677 feet to the upper end of NFRC10 where Moonlight Creek enters the North Fork of Rapid Creek. Current land use is range land.

Reach	NFRC9b
Length (ft)	2,677
Top of Reach Elevation (ft)	5,240
Stream Order	2nd
Slope (%)	1.1
Sinuosity	1.1
Drainage Area (miles^2)	6.3
SVAP	Fair
SECI	Slight
Erosion (t/yr)	3

This NFRC9b photo was taken facing upstream.

The channel is moderately incised. Riparian vegetation extended at least one active channel width. Stream banks were moderately stable. About 20% to 50% of the creek was shaded. Livestock were able to access the creek. There were no fish migration barriers in this reach.

The reach was had some erosion with mostly protected banks. Stream banks were predominantly covered by perennial vegetation. Average bank height was about 2 feet. Channel substrates were silts with recent deposition. This reach had evidence riprap along eroding areas near the county road.

Identified Problems

1. Sediment from stream bank erosion.
2. Temperature from lack of canopy cover.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Riparian Forest Buffer (NRCS PS-391A), Channel Vegetation (NRCS PS-322), Tree/Shrub Establishment (NRCS PS-612)

North Fork Rapid Creek Reach 10 (NFRC10)

The reach starts in the NE1/4 of the SE1/4 of Section 28, Township 6 South, Range 36 East extends downstream for 2,614 feet to the upper end of NFRC11. Current land use is range land.

Reach	NFRC10
Length (ft)	2,614
Top of Reach Elevation (ft)	5,174
Stream Order	2nd
Slope (%)	1.1
Sinuosity	1.3
Drainage Area (miles^2)	7.8
SVAP	Fair
SECI	Moderate
Erosion (t/yr)	128

This photo was taken facing downstream at the start of NFRC10.

The channel is slightly incised. Riparian vegetation extended at least one active channel width. Stream banks were moderately unstable. About 20% to 50% of the creek was shaded. Livestock were able to access the creek. Two animal feed operations were located within the reach. Road culverts were possibe fish migration barriers in this reach. The reach was found to have erosion and cracking present on stream banks at the top of the reach. Stream banks were predominantly bare and unprotected and with mixed annual and perennial vegetation. Average bank height was about 4 feet. Channel substrates were silts with recent deposition.

Identified Problems

1. Sediment from tributary, stream bank erosion, livestock access and animal feed operations.
2. Temperature from lack of canopy cover.
3. Nutrients from livestock confinement areas and grazing animals.

Recommended BMPs

1) Waste Management System (NRCS PS-312)
   - With Corral Berm (NRCS PS-313-D), Waste Storage Facility (NRCS PS-313-C), Nutrient Management Plan (NRCS PS-590)
2) Prescribed Grazing (NRCS PS-528A)
   - With Spring Development (NRCS PS-574), Water Well (NRCS PS-642), Fencing (NRCS PS-382), Watering Facility (NRCS PS-614), Pipeline (NRCS PS-516), Use Exclusion (NRCS PS-472), Channel Vegetation (NRCS PS-322)
3) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Riparian Forest Buffer (NRCS PS-391A), Fencing (NRCS PS-382), Use Exclusion (NRCS PS-472), Channel Vegetation (NRCS PS-322), Tree/Shrub Establishment (NRCS PS-612), Fish Passage (NRCS PS-396)

North Fork Rapid Creek Reach 11 (NFRC11)

The reach starts in the SE1/4 of the SE1/4 of Section 28, Township 6 South, Range 36 East extends downstream for 4,753 feet to the upper end of NFRC11. Current land use is range land.

Reach	NFRC11
Length (ft)	4,753
Top of Reach Elevation (ft)	5,140
Stream Order	2nd
Slope (%)	1.3
Sinuosity	1.1
Drainage Area (miles^2)	11.0
SVAP	Fair
SECI	Moderate
Erosion (t/yr)	435

This photo was taken facing downstream at the beginning of NFRC11.

The channel is moderately incised. Riparian vegetation extended at least one active channel width. Stream banks were moderately unstable. About 20% to 50% of the creek was shaded. Occasional manure was found in the creek. A road culvert was possibly a fish migration barrier in this reach. The reach was found to have erosion and cracking present on stream banks. One blown out inactive beaver dam was present. Stream banks were predominantly bare and unprotected and with mixed annual and perennial vegetation. Average bank height was about 5 feet. Channel substrates were silts with recent deposition.

Identified Problems

1. Sediment from stream bank erosion.
2. Temperature from lack of canopy cover.
3. Nutrients from grazing animals.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Riparian Forest Buffer (NRCS PS-391A), Fencing (NRCS PS-382), Fish Passage (NRCS PS-396), Use Exclusion (NRCS PS-472), Tree/Shrub Establishment (NRCS PS-612), Stream Bank & Shoreline Protection (NRCS PS-580), Channel Vegetation (NRCS PS-322)
2) Prescribed Grazing (NRCS PS-528A)
   - With Spring Development (NRCS PS-574), Water Well (NRCS PS-642), Fencing (NRCS PS-382), Watering Facility (NRCS PS-614), Pipeline (NRCS PS-516), Use Exclusion (NRCS PS-472), Stream Bank & Shoreline Protection (NRCS PS-580), Channel Vegetation (NRCS PS-322)

West Fork Rapid Creek

West Fork Rapid Creek Reach 4 (WFRC4)

The reach starts in the SE1/4 of the SW1/4 of Section 24, Township 6 South, Range 35 East and extends downstream for 1,309 feet to the start of WFRC5. Current land use is hay land.

Reach	WFRC4
Length (ft)	1,309
Top of Reach Elevation (ft)	5,650
Stream Order	2nd
Slope (%)	3.8
Sinuosity	1.4
Drainage Area (miles^2)	1.5
SVAP	Good
SECI	Slight
Erosion (t/yr)	0

This photo of WFRC4 was taken looking downstream.

The channel was not incised. Riparian zone vegetation extended at least two active channel width. Stream banks were low and stable. Willows were abundant. More than 75% of the creek was shaded. There was no evidence of livestock access to the riparian area. The reach was vertically stable with a culvert that was a possible fish migration barrier at the start of the reach. The reach does not appear to be eroding with very little unprotected bank. Stream banks were covered with perennial vegetation. Average bank height was about 2 feet high. Channel substrates were silts and gravels with no evidence of deposition. The upper 200 feet of the reach has been channelized and is impacted from the county road and field access road culvert.

Identified Problems

1. Sediment from road surface and embankment.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Riparian Forest Buffer (NRCS PS-391A), Tree/Shrub Establishment (NRCS PS-612), Channel Vegetation (NRCS PS-322), Fish Passage (NRCS PS-396)

West Fork Rapid Creek Reach 5 (WFRC5)

The reach starts in the SE1/4 of the SE1/4 of Section 24, Township 6 South, Range 35 East and extends downstream for 1,304 feet to the start of WFRC6. Current land use is forest land.

Reach	WFRC5
Length (ft)	1,304
Top of Reach Elevation (ft)	5,600
Stream Order	2nd
Slope (%)	>4.0
Sinuosity	1.1
Drainage Area (miles^2)	2,2
SVAP	Poor
SECI	Moderate
Erosion (t/yr)	80

This photo of WFRC5 was taken looking downstream.

The channel is deeply incised. Riparian zone vegetation extended less than a third of the active channel width. Stream banks were high and unstable. Less than 20% of the creek was shaded. There was no evidence of livestock access to the riparian area. The reach was vertically unstable with several active headcuts that were possible fish migration barriers. The reach had evidence of erosion and 40% to 70% of the stream banks were bare but protected by riprap. Average bank height was about 3 feet high. Channel substrates were silts and gravels with recent evidence of deposition. About 720 feet of the reach was riprap on the left stream bank.

Identified Problems

1. Sediment from road surface and embankment.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Stream Bank & Shoreline Protection (NRCS PS-580), Fish Passage (NRCS PS-396), Stream Channel Stabilization (NRCS PS-584), Channel Vegetation (NRCS PS-322), Critical Area Planting (NRCS PS-342)

West Fork Rapid Creek Reach 9 (WFRC9)

The reach starts in the SE1/4 of the SE1/4 of Section 30, Township 6 South, Range 36 East and extends downstream for 1,396 feet to the start of WFRC10. Current land use is forest land.

Reach	WFRC9
Length (ft)	1,396
Top of Reach Elevation (ft)	5,400
Stream Order	2nd
Slope (%)	3.0
Sinuosity	1.2
Drainage Area (miles^2)	5.4
SVAP	Excellent
SECI	Slight
Erosion (t/yr)	0

This photo of WFRC9 was taken looking downstream.

The channel is not incised. Riparian zone vegetation extended at least two active channel widths. Stream banks were low and stable. More than 75% of the creek was shaded. There was no evidence of livestock access to the riparian area. The reach was vertically stable with a culvert possibly causing a fish migration barrier. The reach does not appear to be eroding. Very little unprotected banks and predominantly covered by perennial vegetation. Average bank height was about 2 feet. Channel substrates consisted of silt, sand and gravel with no evidence of deposition.

Identified Problems

1. Sediment from road embankment.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Stream Bank & Shoreline Protection (NRCS PS-580), Fish Passage (NRCS PS-396), Stream Channel Stabilization (NRCS PS-584), Channel Vegetation (NRCS PS-322), Critical Area Planting (NRCS PS-342)

West Fork Rapid Creek Reach 11 (WFRC11)

The reach starts in the NW1/4 of the NW1/4 of Section 32, Township 6 South, Range 36 East and extends downstream for 3,073 feet to the start of WFRC12. Current land use is forest land.

Reach	WFRC11
Length (ft)	3,073
Top of Reach Elevation (ft)	5,340
Stream Order	2nd
Slope (%)	1.1
Sinuosity	1.2
Drainage Area (miles^2)	6.8
SVAP	Excellent
SECI	Slight
Erosion (t/yr)	0

This photo of WFRC11 was taken looking downstream.

The channel is not incised. Riparian zone vegetation extended at least two active channel widths. Stream banks were low and stable. More than 75% of the creek was shaded. There was no evidence of livestock access to the riparian area. The reach was vertically stable. The reach does not appear to be eroding. There were very little unprotected banks, which were covered by perennial vegetation. Average bank height was about 2 feet. Channel substrates consisted of silt, sand and gravel with no evidence of deposition.

Identified Problems

1. Sediment from road embankment.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Channel Vegetation (NRCS PS-322), Critical Area Planting (NRCS PS-342)

West Fork Rapid Creek Reach 13 (WFRC13)

The reach starts in the SE1/4 of the NE1/4 of Section 32, Township 6 South, Range 36 East and extends downstream for 2,506 feet to the start of WFRC12. Current land use is forest land.

Reach	WFRC13
Length (ft)	2,506
Top of Reach Elevation (ft)	5,270
Stream Order	2nd
Slope (%)	1.0
Sinuosity	1.2
Drainage Area (miles^2)	8.0
SVAP	Fair
SECI	Moderate
Erosion (t/yr)	74

This photo of WFRC13 was taken looking downstream.

The channel is not incised. Riparian zone vegetation extended at least two active channel widths. Stream banks were low and stable. More than 75% of the creek was shaded. There was no evidence of livestock access to the riparian area. The reach was vertically stable with a culvert causing a fish migration barrier. The reach does not appear to be eroding. There were very little unprotected banks, which were covered by perennial vegetation. Average bank height was about 2 feet. Channel substrates consisted of silt, sand and gravel with no evidence of deposition.

Identified Problems

1. Sediment from gravel pit/mine.

Recommended BMPs

1) Water & Sediment Control Basin (NRCS PS-638), Dike (NRCS PS-356), Diversion (NRCS PS-362), Critical Area Planting (NRCS PS-342)

West Fork Rapid Creek Reach 14 (WFRC14)

The reach starts in theNW1/4 of the SW1/4 of Section 33, Township 6 South, Range 36 East and extends downstream for 1,572 feet to the start of WFRC15. Current land use is range land.

Reach	WFRC14
Length (ft)	1,572
Top of Reach Elevation (ft)	5,200
Stream Order	2nd
Slope (%)	1.6
Sinuosity	1.2
Drainage Area (miles^2)	9.3
SVAP	Good
SECI	Slight
Erosion (t/yr)	0

This photo of WFRC14 was taken looking downstream from the start.

The channel is incised. Riparian zone vegetation extended at least one active channel width. Stream banks were low and moderately stable. About 20% to 50% of the creek was shaded. There was no evidence of livestock access to the riparian area. The reach was vertically stable. The reach does not appear to be eroding. There were very little unprotected banks, which were covered by perennial vegetation. Average bank height was about 3 feet. Channel substrates consisted of silt, sand and gravel with no evidence of deposition.

Identified Problems

1. Sediment from road surface and embankment.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Fish Passage (NRCS PS-396), Critical Area Planting (NRCS PS-342)

West Fork Rapid Creek Reach 18 (WFRC18)

The reach starts in the SE1/4 of the SE1/4 of Section 33, Township 6 South, Range 36 East and extends downstream for 1,541 feet to the confluence with North Fork Rapid Creek. Current land use is range land.

Reach	WFRC18
Length (ft)	1,541
Top of Reach Elevation (ft)	5,080
Stream Order	2nd
Slope (%)	1.0
Sinuosity	1.2
Drainage Area (miles^2)	11.5
SVAP	Poor
SECI	Severe
Erosion (t/yr)	199

This photo of WFRC18 was taken looking upstream from the end.

The channel is incised. Riparian zone vegetation extends at least one third of the active channel width. Stream banks were high and unstable. Less than 20% of the creek was shaded. There was extensive amount of manure on the banks and in the creek. A small animal feed operations was present within the reach. The reach had several headcuts and was vertically unstable with possible fish migration barriers. The reach is severely eroding. There were very little protected banks with evidence of livestock trampling. About 40% of the banks were bare with the remainder covered by a mixture of highly utilized annual and perennial vegetation. Average bank height was about 3 feet. Channel substrates consisted of silt, sand and gravel with evidence of recent deposition.

Identified Problems

1. Sediment from stream bank and bed erosion.
2. Temperature from lack of canopy cover.
3. Nutrients from grazing animals and animal feed operation.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Riparian Forest Buffer (NRCS PS-391A), Fencing (NRCS PS-382), Use Exclusion (NRCS PS-472), Stream Bank & Shoreline Protection (NRCS PS-580), Stream Channel Stabilization (NRCS PS-584), Fish Passage (NRCS PS-396), Tree/Shrub Establishment (NRCS PS-612), Channel Vegetation (NRCS PS-322), Critical Area Planting (NRCS PS-342), Prescribed Grazing (NRCS PS-528A), Spring Development (NRCS PS-574), Water Well (NRCS PS-642), Watering Facility (NRCS PS-614), Pipeline (NRCS PS-516), Use Exclusion (NRCS PS-472)

Hagler Creek

Hagler Creek Reach 2 (HC2)

The reach starts in the SW1/4 of the SE1/4 of Section 27, Township 6 South, Range 36 East and extends downstream for 758 feet to the start of MNC5a. Current land use is pasture and county road turn around.

Reach	HC2
Length (ft)	758
Top of Reach Elevation (ft)	5,640
Stream Order	2nd
Slope (%)	2.0
Sinuosity	1.2
Drainage Area (miles^2)	1.1
SVAP	Poor
SECI	Moderate
Erosion (t/yr)	37

The channel was slightly incised. Riparian zone vegetation extended at least one active channel width. Stream banks were somewhat high and recovering but stable. 20 to 50% of the creek was shaded. There was evidence of livestock access to the riparian area. A small animal feed operation was present within the reach. The reach was stable with the culvert posing a fish migration barrier. The reach does appear to be eroding with some unprotected bank. Stream banks were covered with perennial vegetation. Average bank height was about 4 feet high. Channel substrates were silts. The upper 80 feet of the reach has been covered and put into a 24" culvert pipe.

This photo of HC2 was taken looking upstream.

Identified Problems

1. Sediment from road embankment, stream bank erosion, livestock access and animal feed operation.
2. Temperature from lack of canopy cover.
3. Nutrients from animal feed operations and grazing animals.

Recommended BMPs

1) Animal Waste System (NRCS PS-313)
   - With Corral Berm (NRCS PS-313-D), Waste Storage Pond (NRCS PS-313-C), Nutrient Management Plan (NRCS PS-590)
2) Prescribed Grazing (NRCS PS-528A)
   - With Spring Development (NRCS PS-574), Water Well (NRCS PS-642), Fencing (NRCS PS-382), Watering Facility (NRCS PS-614), Pipeline (NRCS PS-516), Use Exclusion (NRCS PS-472), Channel Vegetation (NRCS PS-322)
3) Stream Habitat Improvement and Management (NRCS PS-395)
   - Fish Passage (NRCS PS-396), Riparian Forest Buffer (NRCS PS-391A), Fencing (NRCS PS-382), Use Exclusion (NRCS PS-472), Tree/Shrub Establishment (NRCS PS-612), Channel Vegetation (NRCS PS-322)

McNabb Creek

McNabb Creek Reach 4 (MNC4)

The reach starts in the SW1/4 of the NE1/4 of Section 27, Township 6 South, Range 36 East and extends downstream for 2,877 feet to the start of MNC5a. Current land use is range land and forest land.

Reach	MNC4
Length (ft)	2,877
Top of Reach Elevation (ft)	5,960
Stream Order	1st
Slope (%)	2.0
Sinuosity	1.2
Drainage Area (miles^2)	2.3
SVAP	Good
SECI	Slight
Erosion (t/yr)	1

This photo of MNC4 was taken looking downstream at the start of the reach.

The channel is not incised. Riparian zone vegetation extended at least one active channel width. Stream banks were low and stable. More than 50% of the creek was shaded. Several species of willows were observed and cottonwoods. There was evidence of livestock access to the riparian area. The animal feed operation located in reach HC2 also extends into the lower end of this reach.

The reach was vertically stable with no fish migration barriers. The reach had no evidence of erosion and >95% of the stream banks were covered by perennial vegetation and cobbles. Average bank height was about 2 feet. Channel substrates were coarse gravel and cobbles with no recent evidence of deposition.

Identified Problems

1. Sediment from stream bank erosion.
2. Temperature from lack of canopy cover.
3. Nutrients from grazing animals.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Riparian Forest Buffer (NRCS PS-391A), Fencing (NRCS PS-382), Use Exclusion (NRCS PS-472), Tree/Shrub Establishment (NRCS PS-612), Channel Vegetation (NRCS PS-322)

McNabb Creek Reach 5a (MNC5a)

The reach starts in the SE1/4 of the SW1/4 of Section 27, Township 6 South, Range 36 East and extends downstream for 780 feet to the start of MNC5b. Current land use is pasture and hay land.

Reach	MNC5a
Length (ft)	780
Top of Reach Elevation (ft)	5,200
Stream Order	1st
Slope (%)	2.0
Sinuosity	1.2
Drainage Area ($miles^2$)	3.5
SVAP	Fair
SECI	Moderate
Erosion (t/yr)	77

This photo of MNC5a was taken looking upstream.

The channel is incised. Riparian zone vegetation extended at least one active channel width. Stream banks were somewhat high and unstable. 20% to 50% of the creek was shaded. There was occasional manure in the creek. The reach was vertically stable. There were no fish migration barriers. The reach does appear to be eroding. About 40% to 70% bare stream banks covered by annual and perennial vegetation. Average bank height was about 7 feet. Channel substrates consisted of silt, sand and gravel with evidence of recent deposition.

Identified Problems

1. Sediment from road.

Recommended BMPs

1) Stream Habitat Improvement and Management (NRCS PS-395)
   - With Riparian Forest Buffer (NRCS PS-391A), Fencing (NRCS PS-382), Use Exclusion (NRCS PS-472), Tree/Shrub Establishment (NRCS PS-612), Channel Vegetation (NRCS PS-322)
2) Prescribed Grazing (NRCS PS-528A)
   - With Spring Development (NRCS PS-574), Water Well (NRCS PS-642), Fencing (NRCS PS-382), Watering Facility (NRCS PS-614), Pipeline (NRCS PS-516), Use Exclusion (NRCS PS-472)

McNabb Creek Reach 5b (MNC5b)

The reach starts in the SW1/4 of the SW1/4 of Section 27, Township 6 South, Range 36 East and extends downstream for 637 feet to the start of MNC5c. Current land use is pasture.

Reach	MNC5b
Length (ft)	637
Top of Reach Elevation (ft)	5,160
Stream Order	1st
Slope (%)	2.0
Sinuosity	1.1
Drainage Area (miles^2)	3.7
SVAP	Poor
SECI	Moderate
Erosion (t/yr)	93

This photo of MNC5b was taken looking upstream in the middle of the reach.

The channel is deeply incised. Riparian zone vegetation extended at least one active channel width. Stream banks were high and unstable. 20% to 50% of the creek was shaded. There was occasional manure in the creek. Two small animal feed operations are present within the reach. The reach was vertically unstable with some minor head cuts. A culvert is possibly a fish migration barrier within the reach. The reach does appear to be eroding. About 40% to 70% bare stream banks covered by annual and perennial vegetation. Average bank height was about 7 feet. Channel substrates consisted of silt and gravel with evidence of recent deposition.

Identified Problems

1. Sediment from stream bank and bed erosion, livestock access and animal feed operation.
2. Temperature from lack of canopy cover.
3. Nutrients from animal feed operations and grazing animals.

Recommended BMPs

1) Waste Management System (NRCS PS-312)
   - With Corral Berm (NRCS PS-313-D), Waste Storage Pond (NRCS PS-313-C), Nutrient Management Plan (NRCS PS-590)
2) Stream Habitat Improvement and Management (NRCS PS-395)
   With Riparian Forest Buffer (NRCS PS-391A), Fish Passage (NRCS PS-396), Fencing (NRCS PS-382), Use Exclusion (NRCS PS-472), Tree/Shrub Establishment (NRCS PS-612), Channel Vegetation (NRCS PS-322)

APPENDIX B

Reach Data Tables and Figures

Table B-1. North and West Forks Rapid, Hagler and McNabb Creeks Stream Visual Assessment Protocol (SVAP) Summary

Reach	Length (ft)	Channel Condition	Hydrologic Alteration	Riparian Zone	Bank Stability	Water Appearance	Nutrient Enrichment	Fish Barriers	Instream Fish Cover	Pools	Invertebrate Habitat	Canopy Cover	Manure Presence	Macro-invertebrates	SVAP Rating	Total Score	Overall Score
NFRC3B	2,130	6.5	6.5	4	4.5	7	7	1	4	1	5	3	5	6	Poor	60.5	4.7
NFRC5	1,166	8	8	10	9	9	9	3	9	5	10	7	3	10	Good	100	7.7
NFRC8	1,665	6	7	8	7	7	10	10	5	3	10	3	--*	10	Fair	86	7.2
NFRC9A	1,726	6	7	5	5	7	7	10	5	3	7	1	3	10	Poor	76	5.8
NFRC9B	2,677	7	5	8	8	8	8	10	8	3	7	3	5	10	Fair	90	6.9
NFRC10	2,614	8	8	9	5	5	9	3	8	3	10	3	5	10	Fair	86	6.6
NFRC11	4,753	7	5	8	5	3	7	10	8	5	8	3	3	6	Fair	78	6.0
WFRC4	1,309	9	10	10	10	8	8	10	8	3	9	8	--*	--*	Good	93	8.5
WFRC5	1,304	1	3	1	1	10	10	5	1	1	5	1	--*	--*	Poor	39	3.5
WFRC9	1,396	6	9	10	10	9	10	9	10	7	10	10	--*	15	Excellent	115	9.6
WFRC11	3,073	9	9	10	10	8	10	10	10	7	10	10	--*	15	Excellent	118	9.8
WFRC13	2,506	7	5	8	7	7	7	1	8	7	7	7	--*	8	Fair	79	6.6
WFRC14	1,572	8	6	7	7	10	10	10	10	6	10	5	--*	15	Good	104	8.7
WFRC18	1,541	7	5	3	3	8	8	5	3	5	5	1	1	5	Poor	59	4.5
MNC4	2,877	9	10	9	10	8	10	10	8	3	10	8	5	--*	Good	100	8.3
MNC5A	780	7	5	8	2	9	9	10	5	3	8	5	3	--*	Fair	74	6.2
MNC5B	637	5	3	8	3	7	9	1	5	5	8	1	--*	--*	Poor	55	5.0
HC2	758	7	8	8	5	7	10	1	3	3	3	3	5	--*	Poor	63	5.3
	6.5	**Miles**				**Percent in Poor Condition**				**37%**			**Average for reaches**		**Fair**	**82.0**	**6.7**
						Percent in Fair Condition				**30%**							
						Percent in Good Condition				**20%**							
						Percent in Excellent Condition				**13%**							

"--*" = the SVAP rating factor was not applicable or unable to measure, thus the factor was not added to the reach's average score.

Figure B-1. North and West Forks Rapid, Hagler and McNabb Creeks SVAP Results Chart

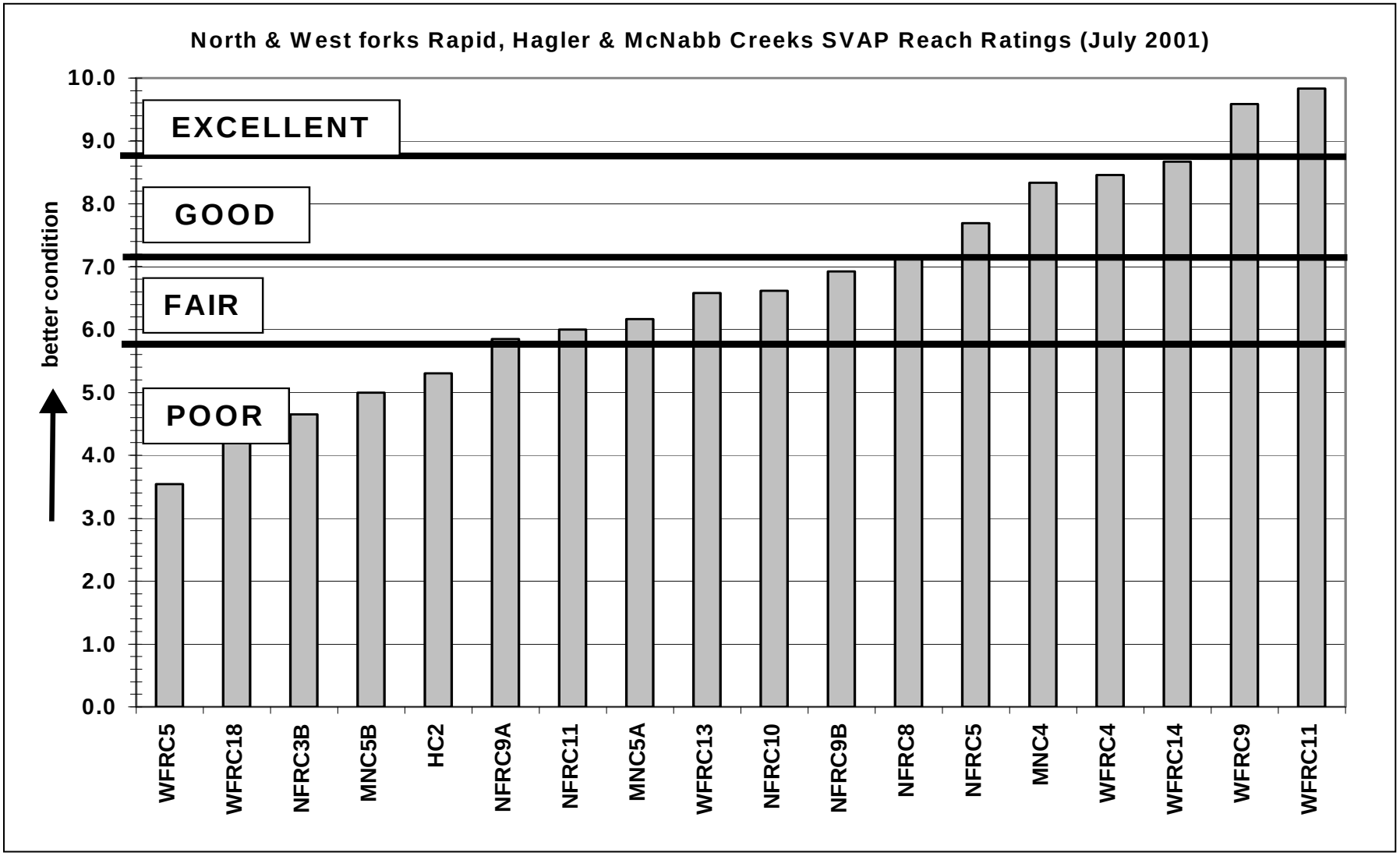


Table B-2. North and West Forks Rapid, Hagler and McNabb Creeks Rosgen Stream Type Classifications

Reach	Channel Length [ft]	Rosgen Stream Type	Bankfull Width (W_{bkf}) [ft]	Mean Depth (d_{bkf}) [ft]	Cross Sectional Area (A_{bkf}) [ft^2]	Width/Depth ($W_{bkf/dbkf}$)	Maximum Depth ($_{mbkf}$) [ft]	Flood Prone Width Area (W_{fpa}) [ft]	Entrenchment Ratio (ER)	Channel Materials (D50) [mm]	Water Surface Slope (S) [ft/ft]	Channel Sinuosity (K)
NFRC3B	2,130	E6	3.4	1.5	5.1	2.3	2.3	67	20.0	0.06	0.014	1.5
NFRC5	1,166	E6b	5.6	1.0	5.6	5.6	1.5	14	2.5	3.00	0.040	1.2
NFRC8	1,665	B4c	10.0	1.1	11.0	9.1	1.7	19	1.9	11.30	0.009	1.1
NFRC9A	1,726	B5c	16.5	1.7	28.1	9.7	2.6	32	1.9	0.22	0.004	1.1
NFRC9B	2,677	G6c	14.0	1.3	18.2	11.0	2.0	19	1.3	0.06	0.011	1.1
NFRC10	2,614	B6c	15.4	1.4	21.6	11.0	2.1	26	1.7	0.06	0.011	1.3
NFRC11	4,753	C5	14.0	1.3	18.2	10.8	2.0	35	2.5	0.20	0.013	1.1
WFRC4	1,309	E5b	5.0	1.3	6.5	4.0	2.0	82	16.4	1.00	0.038	1.4
WFRC9	1,396	E5b	9.0	1.4	12.6	6.4	2.1	39	4.3	0.45	0.030	1.2
WFRC11	3,073	E6	13.0	1.4	18.2	9.3	2.1	30	2.3	0.06	0.011	1.2
WFRC13	2,506	C4	12.0	1.0	12.0	12.0	1.5	38	3.2	4.00	0.010	1.2
WFRC14	1,572	G5c	10.0	1.3	13.0	7.7	1.9	12	1.2	0.30	0.016	1.2
WFRC18	1,541	B5c	12.5	1.3	16.3	9.6	1.8	20	1.6	0.33	0.010	1.2
MNC4	2,877	E4b	6.0	1.0	6.0	6.0	1.3	34	5.6	0.23	0.020	1.2
MNC5A	780	E6b	5.0	0.7	3.5	7.1	1.0	11	2.2	0.06	0.020	1.2
HC2	637	E6b	8.0	1.0	8.0	8.0	1.5	20	2.5	0.06	0.020	1.1

Table B-3. North & West Forks Rapid, Hagler & McNabb Creeks Stream Erosion Condition Inventory (SECI) Summary

Reach	Length (ft)	Streambank Length (ft)	Bank Height (ft)	Soil Texture	Bulk Density (lbs/ft3)	Erosion Evidence	Bank Condition	Bank Cover	Lateral Stability	Channel Bottom	Deposition	Erosion Severity	LRR Index Value	Lateral Recession Rate (ft/yr)	Erosion Rate (tons/yr)
NFRC3B	2,130	4,260	3	silt loam	87.4	2.5	1.5	2	0	2	1	Severe	9.0	0.29	163
NFRC5	1,166	2,332	3	silt loam	87.4	1	0	0	0	0	1	Slight	2.0	0.02	6
NFRC8	1,665	3,330	3	silt loam	87.4	1	0.5	1	1	0.5	-0.5	Slight	3.5	0.05	23
NFRC9A	1,726	3,452	3.75	silt loam	87.4	2	1.5	1.5	0.75	0.5	1	Moderate	7.3	0.20	111
NFRC9B	2,677	5,354	2	silt loam	87.4	1	0.5	0.5	0	0	-1	Slight	1.0	0.01	3
NFRC10	2,614	5,228	4	silt loam	87.4	2.5	1	1	0.5	0	1	Moderate	6.0	0.14	128
NFRC11	4,753	9,506	5	silt loam	87.4	2.5	1	1	1	1	1	Moderate	7.5	0.21	435
WFRC4	1,309	2,618	2	silt loam	87.4	0	0.5	0	0	0	0	Slight	0.5	0.00	0
WFRC5	1,304	2,608	3	silt loam	87.4	1	1	2	1	2	1	Moderate	8.0	0.24	80
WFRC9	1,396	2,792	2	silt loam	87.4	0	0	0	0	0	0	Slight	0.0	0.00	0
WFRC11	3,073	6,146	3	silt loam	87.4	0	0	0	0	0	0	Slight	0.0	0.00	0
WFRC13	2,005	4,010	3	silt loam	87.4	2	0.5	0.5	1	1	1	Moderate	6.0	0.14	73
WFRC14	1,572	3,144	3	silt loam	87.4	0	0	0	0	0	0	Slight	0.0	0.00	0
WFRC18	1,541	3,082	3	silt loam	87.4	3	3	2	1	2	1	Severe	12.0	0.49	199
MNC4	2,877	5,754	2	silt loam	87.4	0.5	0	0	0	0	0	Slight	0.5	0.00	1
MNC5A	780	1,560	7	silt loam	87.4	2	1	1.5	0	1	1	Moderate	6.5	0.16	77
MNC5B	637	1,274	8	silt loam	87.4	2	1	1	0.5	2	1	Moderate	7.5	0.21	93
HC2	758	1,516	4	silt loam	87.4	2	1	1	0	1	1	Moderate	6.0	0.14	37
	6.5	**Miles**	**Percent of stream with a Slight Problem**					**46%**						TOTAL	1,429
			Percent of stream with a Moderate Problem					**43%**							
			Percent of stream with a Severe Problem					**11%**							

Figure B-2. North and West Forks Rapid, Hagler and McNabb Creeks SECI Erosion Results Chart

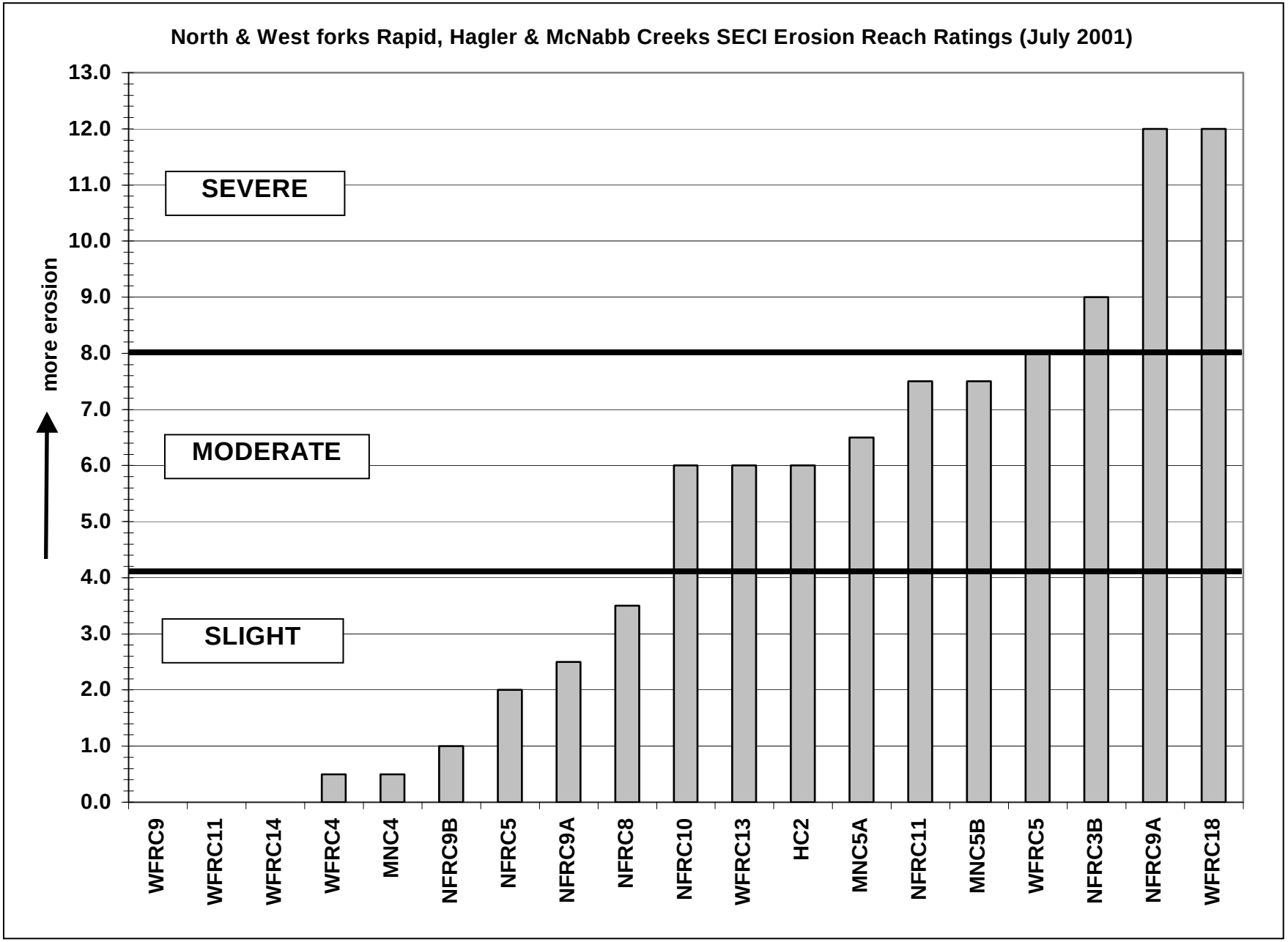
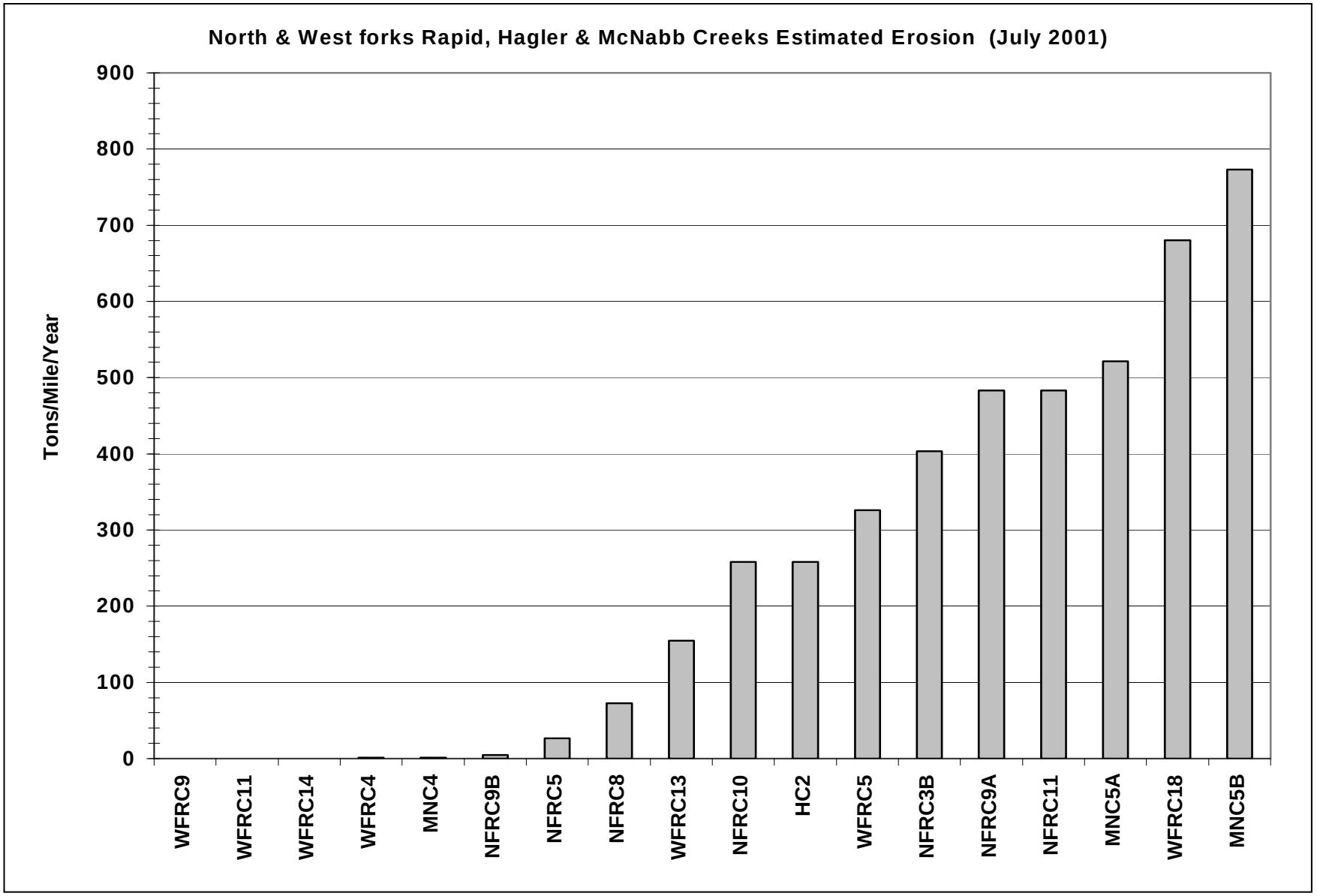


Figure B-3. North and West Forks Rapid, Hagler and McNabb Creeks SECI Reach Erosion Rates*



* Erosion Rate = (Stream Length *2) * Bank Height * Bulk Density * Lateral Recession Rate